RAILROAD GAZETTE

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CONTENTS

Timber Preservation.

From the interesting and instructive address on this subject delivered by Dr. Hermann von Schrenk, of the Mississippi Valley Laboratory of the Bureau of Plant Industry, U. S. Department of Agriculture, before the December meeting of the Western Railway Club we extract a few paragraphs. This lecture was illustrated with lantern slides showing the structure and growth of timbers, the manner in which decay occurs, European practice in the use of timber for tie purposes, various specimens of treated timbers by the different processes, and methods of piling ties. Many of these slides appear in a government report by Dr. von Schrenk on "The Decay of Timber," recently issued by the Department of Agriculture, and which may be had upon application.

Referring to the relation between the general forestry question and the railroads he said: This question is frequently asked us: "What has the United States Government to do with 'pickling' ties?" The subject of timber preservation came up under the general head of the study of our forest supplies, and where we are going to look for the great masses of timber in the future. About three years ago several of the large railroad companies requested that a general study be made of the very much discussed problem, timber preservation, and as we regard the preservation of timber, or making it last longer, as one method of cutting less timber out of our forests, and consequently of having a greater amount of it left for future use, you can see that the subject of timber preservation forms one of perhaps two or three of the leading problems that we are confronted with in the administration of any forestry policy to-day. The other two lines which we have to look to will be a more conservative method of cutting timber, using more foresight and wasting less, and the other in the replanting of large tracts of land.

The matter of cutting timber is intimately related to the subject of timber preservation, because one way out of the difficulty of looking towards a future supply will be to take care of forest tracts already in existence. The Baltimore & Ohio Railroad has taken a very foremost stand in that matter, and has considered the advisability of retaining large tracts of forest land which have come into its possession recently, with a view of cutting out its tie supply in a scientific and accurate manner, so as to insure a supply for all time to come. Whether or not that is going to be practical will be demonstrated in the course of a few months, when a working plan is to be considered applying to its tract of land. The question of reserving tracts of forest land for their own use is a matter some of the roads are coming to, and perhaps all, some time in the future. No one doubts that very seriously to-day. At present the idea of reserving forest tracts lies chiefly with those that have large areas of timber lands. As for most of us, we are most concerned in the immediate use of the timber, and the question that confronts us, when we buy a piece of wood, whether it be for a tie, a fence post, a telephone or telegraph pole, or a bridge timber, is: How can we get the most for the money out of that particular piece of material? It is in respect to this problem that I wish to offer a few suggestions, and give a few preliminary facts as to what we are doing in the way of solving it.

In the first place, I think every one realizes that the amount of timber which we have at hand is gradually growing less. I am going to confine myself largely to the tie business to-day, because the tie business is perhaps the most critically indicative feature in the way of testing what we can do toward increasing the length of life of timber. If we can make a tie last in the railroad track, we can take care of the telephone and telegraph poles, bridge timbers and other timber. The tie lies in a position where the deteriorating influences have the greatest opportunities, and if we can solve the question of making the ties last we can solve the rest.

There were used last year 110,000,000 ties. One firm in Chicago has contracts for eight years to cut timber every year off 300 square miles of land. From these figures you can form some idea of the quantity of material which is being used, and it is highly important that we should be doing something toward regulating the use of such quantities of timber.

The trouble with a great deal of the preserving work that has been done in the United States for the last 15 or 20 years has been that the timber has been taken from the woods, run through a cylinder, some salt pumped into it, and then slammed into the track. The results in some cases are poor, in others not so bad, but if they happen to be poor, the preserving process as a whole was condemned without question.

Timber preserving includes not only an injecting of salt; it is a much larger problem. I can, perhaps, give you an example: If you were to take a tie when it costs $1, and treat it with a process of treatment that costs 75 cents, as they do abroad now, you may get a life of about 20 years; suppose that tie is put down in the track with a heavy rail on it, a tremendous amount of traffic going over it; in a short time the tie is cut to pieces under the rail, and it has to be taken out after 12 or 13 years. In this case you have not got the full value out of that tie; you have got to make it last at least 20 years in order to do so. The foregoing goes to show that if you think of preserving timber, you have got to preserve it not only with a view to its lasting power as far as decay is concerned, but also to prevent its wearing out. Besides the actual preserving, timber preservation requires the consideration of the manner of fastening the rails to the ties, tie plates, and the question of ballast; also the question of the reciprocal relation between the weight of the material passing over the track and the weight of the material of which that track is made.

We may now ask: In what way does timber preservation count? In other words, what does it really amount to? Where ought we to apply it? What ought we to expect of it? How far is it practical?

Last week I spent five or six days along the Gulf of Mexico, in the State of Texas and in Louisiana, looking over some matters in connection with tests that we are making with the roads in the extreme South, and I came across some yellow pine which had been sent to the testing plant to be creosoted. The timber had been rejected by the person in charge of the plant on the ground that the yellow pine could not be creosoted profitably. Loblolly pine, an inferior timber, had then been sent, and was creosoted with great success. This is an illustration of one point I wish to bring out, namely, it is going to be the aim to take a poor, low-grade, short-lived timber, which will cost little to begin with, and to get the longest life out of it by treating the poor, short-lived and low-priced timber with a good preservative. That is, we will take the porous, quickly-rotting timbers which are still present in large quantities, taking as an example in this country, the red oak, the tamarack, the hemlock, the various grades of swamp oak; in the South the beech and the loblolly pine, and in the North the various grades of the true fir and the lodgepole pine, and treat these with tar oil, or with tar oil and zinc chloride, with carbolineum, or any other good process. The future timber preservation in this country is going to look to these poorer materials which are porous, which will absorb the preservative readily and which it will pay to treat.

The first thing in timber preservation is, that it is going to allow us to utilize sources of supply that have not hitherto been utilized. In the second place, it is going to make possible a great saving in the operating of roads, because it is going to save us the cost of replacing material. It is going to enable us, furthermore, to bring about more system in the method of treating track operation. Any one who has seen how systematized the work has been in European countries since the adoption of timber preservation will be impressed with that.

In order to understand fully what successful and what poor preserving means, we have to know something about the structure of the material that we are dealing with, and I am going to take a few minutes in showing what wood consists of, a subject with which most of you are probably familiar. But to impress it upon you at this time, I am going to show you that wood is not a series of long pipes into which the preservative can be blown, as thought by many, but that it is a very complicated series of cells, which are closed, and that one must use a great deal of force in the majority of cases to get a preservative into the wood.

I mean to show you that wood contains a lot of organic substances which act as a food supply for those peculiar organisms which bring about decay. The so-called rotting is due to low organisms or plants which we call fungi, which bring about the decay of wood with greater or less rapidity, depending on the kind of timber. What we do in preserving is to place some kind of a chemical into that wood that will prevent the growth of these lower organisms, and the growth will be prevented just as long as the preservative remains in the timber. The minute it falls below the minimum, growth will begin and the tie will start to rot. Some preservatives remain in the timber for a longer, some for a shorter period. The ideal preservative will be the one which readily goes into the wood, which stays there, and which is cheap.

Wood, as I have said, is composed of a series of very complicated cells, which are longer or shorter tubes, filled on the outside of a tree with the so-called sap, also with various organic substances, such as sugars, salts, oils, tannins, and various other materials. It depends, to some extent, on the quantity of those materials and the ease with which they remain in that timber, that we get the wood rotting or lasting for any length of time. . . .

You will notice from these various methods [shown by the slides] that we are able, by taking a microscope, to determine almost absolutely what particular fungus or organism has produced the peculiar decay that we see there. . . .

This [slide] is a white oak tie which had been in a cinder ballast about three years, and these peculiar punks or toadstools had grown out at one side. It has not been realized for many years that those are the fellows that caused the rot of timber. When they appear on the outer part of the wood, that indicates that the wood inside is already wholly decayed. Whenever you see one of these bodies at the end of a tie, you may be sure that the tie is either partially or totally destroyed. From the holes in such a punk the spores are swarming around by the hundreds of thousands in the air, falling upon the ties that are within reach. The careful section man who picks up the rotten ties and piles them all along the right of way where they are close to the track and leaves them there, is doing the very best he can to infect all the rest of the ties with the spores of the decay-producing fungi. It takes a great deal of urging to impress every one with that fact, because it is difficult to realize that these microscopic objects, the spores, coming out by the millions and swarming around in the air, really do so much harm. . . .

None of these fungi can grow without water. The so-called "dry rot" is simply a form of decay where the fungus requires very little water. Here is a similar fungus, growing on a piece of chestnut timber from New England. This fungus is widely distributed all over the eastern part of the United States, but is not so common in the west. As I have just said, these fungi have to have water in considerable quantities, and they have to have food supplies, such as starches, or sugars. They have to have a certain amount of heat and a certain amount of oxygen. Without oxygen we can have absolutely no growth whatever, so also without a certain amount of heat we can have no growth; but after all the chief factor is water, a point which I wish you would retain in mind, because upon this one factor depend so many of the preventive measures which we have to consider later. . . .

"There is one thing I want to call attention to. In many of these ties you see peculiar S marks. I will ask you to look at those S irons which I have on the table. They are put into the end of a tie to prevent the tie from splitting. There [in Europe] you see a great many of these which are hammered into every tie that might split, and the number of ties which they save in that way is simply astounding. In another slide I am going to show you some splendid specimens of oak ties which might have been saved if such an S iron, costing but ¾ of a cent, had been put in and thereby 50 cents' worth of ties might have been saved."

Referring to methods usually followed in piling ties, and to experiments he had been conducting as to the best method of piling to permit thorough and rapid seasoning before treating, Dr. von Schrenk said:

"The idea which we started out with was in the first place to ascertain if we could not reduce the weight of those ties by drying; in the second place we wanted to get rid of as much water as possible in order to make it possible to treat those ties with greater ease and rapidity. The kinds of piles which we tried were of all sorts and variations. We piled them solid and open, with reference to the wind direction and with reference to the cost of piling."

He further stated that by certain methods of piling they were able to reduce the weight of the ties, from the time of cutting, by 40 per cent. . . .

"One of the greatest elements of success in treating ties will be to let them season out after treatment. This matter of taking ties out of the treating cylinder and placing them into the track as soon as they are taken out is a thing that has got to be remedied sooner or later, because the salts will run out of the tie with as great rapidity if laid in the track, as they would if soaked in water. One element leading toward success in connection with timber preservation is going to be to let treated ties dry out before laying.

"The great objection frequently made is that one cannot wait for ties to dry. 'We have got to have the ties at once; we have got to put them into the track,' is the cry. Most persons have no conception how short a time is really necessary to dry treated ties.

"Here are some ties treated about the 5th of August, and in three months they lost 95 per cent. of the water originally injected into them; in other words, they became air dry in three months. What ought to be done is to take ties out of the treating plant and pile them along the right of way as rapidly as it can be done, and

to leave them there at least three months in summer, somewhat longer in winter.

"Where possible, it will be found cheapest to pile treated ties at the treating plant. This factor ought to be kept in mind in locating treating plants. They ought to be placed in small places, where lots of land can be secured very cheaply. . . .

"In conclusion, I may briefly sum up some of the more important points referred to, and these are:

"1. *Wood* is a complicated material, consisting of closed cells which are variously arranged.

"2. *Decay* is caused by the growth in the wood of low plants, called fungi. These must have water, air, food supply and some heat in order that they may grow. As a result of the growth of these fungi the timber decays.

"3. *Timber preservation* consists first, in the injection of substances into timber to prevent the growth of the fungi, and secondly in subsequent processes of handling, such as drying out treated timber, using proper tie plates, ballast, etc., so as to keep the wood from wearing out.

"4. *Seasoning.* One of the most important preliminary steps to successful treatment consists in having timber perfectly *seasoned*. Ties will season most rapidly when piled for several months after cutting, in such a way that the largest amount of air can circulate between the ties.

"5. *Use of inferior woods.* The time has now come when the greatest financial return will come by using cheap and consequently inferior timbers treated with a good preservative. This will pay far better than the use of high grade timbers treated with cheap preservatives. In other words, it is a poor proposition to treat high grade timbers such as white ash or long leaf pine, and a good proposition to treat well seasoned red or pin oak, beech, loblolly pine, hemlock, etc.

"6. *Relation of treatment to timber supply.* By treating timber so as to prevent decay a large amount of timber will be conserved every year, and in that way a larger future supply is assured."

DISCUSSION.

Prof. W. F. M. Goss (Purdue University): "I have been wondering whether it is possible, from the information in hand, to determine how much can profitably be spent on a tie, the first cost of which is known, in order that it may be treated."

Dr. von Schrenk: "If you take a tie which costs 30 cents, knowing that that tie is going to give six years' service, you put in a preservative that will cost, we will say, 20 cents, which will give perhaps 12 years' service. This will assuredly not pay, because the amount that you are sinking into preserving with a 20-cent treatment will be more than counterbalanced by the renewing which you could make at the end of your six years with an absolutely new tie. If on the other hand you are paying 50 cents or 60 cents for a tie, the situation changes very materially, because at that price a 20-cent treatment on that, with a doubling of length of life, is a paying proposition. I am sure it will be a very paying proposition for a great many of the roads that are using white oak ties, to quit using white oak ties and in their stead use beech ties costing 40 cents and pay 20 cents to treat them. In that way they get a tie that will outlive the oak tie twice over. There is no question that this can be done, and that a treatment can be gotten which will give that life."

Mr. E. E. R. Tratman (*Engineering News*): "As to the preservative materials used, I think it is well admitted that straight creosoting is too expensive in this country for any commercial purpose. It may be used experimentally, but the cost of creosote and the cost of the creosoting process is so great compared with what it is in Europe, that other processes appear to be really much more economical when reckoned on a commercial basis. Of course, if the creosoting is used only as an auxiliary process the case may be very different. In introducing the zinc-creosote process into this country Mr. Chanute had a great deal of trouble to get the proper quality of creosote or tar oil. They would not tell him what their formula was for the creosote, and he had to arrive at it by various scientific deductions, combinations and experiments of his own, and importing oil at great expense, until he got at the material that was similar to what they use abroad with so much success."

Dr. von Schrenk: "I do not believe it is going to be policy for us to say that we have not got tar oil and simply keep still because of that. We have said a great deal on the subject of getting tar oil, and I do not see why we cannot have it in this country as well as, for instance, in Germany. They get their tar oil from their gas works and from their coke ovens. We have more coke ovens than they have over there, five times over, and the matter is going to be one of inducing those who are manufacturing coke, to take those by-products which are now going up in smoke and saving the tar oil and using it. The objection made to that is that the demand for tar oil and the price obtained, are not great enough to warrant going to the trouble and expense of producing it. If the railroad people on the one hand will say, we have no tar oil, and the man that is to make it says that there is no demand for it, then we are not likely to reach any result. The thing to do is for both sides to get together, and if the railroads say they want tar oil, there may be some chance of our getting it.

"I do not think many can afford treatment with tar oil pure and simple, but there are many cheap combinations; for instance, treat with zinc chloride first of all, and put in tar oil afterwards. That has been used on the Mexican lines, and I do not think there is any question but that mixture is a fairly good one, the process costing perhaps 22 to 25 cents; it has not the disadvantage of making a mixture with tar oil where the specific gravity of the tar oil and zinc is exactly the same. I do not think there is any necessity for our sitting down and saying a thing cannot be done. The Dominion Coal & Iron Co., of Canada, this year put up modified beehive ovens so as to save the by-products. I see no reason why, in a few years to come, we will not have as much tar oil as they have abroad."

Dr. von Schrenk (in reply to questions by Mr. A. S. Baldwin, Ill. Cent. R. R.): "In reference to the first question, the first idea of steaming is, to remove water from the wood, in order to allow the other matter that you want to press into the wood to penetrate. I do not care how much steam you put on for a piece of timber, you never succeed in getting that timber sufficiently dry in order to make it as dry as air dried timber. That is the first objection. Oftentimes we have found that a steamed tie weighs almost as much as the green tie before steaming, and that has been the experience of others likewise.

"In the second place, the chance in steaming always is, that you get the timber hot enough to injure the wood fiber. I know that it has been affirmed over and over again that no such injury does take place, but if you remember that many of the compounds which form a portion of the wood fiber change their chemical constituents at a temperature of 230 to 235 degs. F., it is easy to see that when you put steam on, you get a temperature very much above that. But the objection as to that is not so great as to that before made, that the penetration of a substance like tar oil and its consequent union with the fiber cannot possibly be the same when that fiber is full of water, because the tar oil will settle in the pores of the cells and not remain in the wood walls. We have had hundreds of pieces of timber sent from plants that used steam, and there was not a single one that compared with the results gotten abroad.

"The seasoning after treatment refers only to such timbers as they treat with water solution, in order to get out the water and prevent the leaching out of the salts. The leaching out of the salts from the treated timbers goes on with such tremendous rapidity when taken directly from the treating plants, that very few have any notion how fast the salts have come out.

"We made some tests this summer to show the leaching out of salts. We took one or two ties and treated them with the chloride of zinc process, 24 ounces being used for that purpose for each tie. We laid those ties over night in water, and it was ascertained that 5½ ounces of chloride came out of every tie in four and one-half hours. In other words, one-fifth of the salt came out. That might happen any day in the track. Experiments made with sun dried ties brought out something like 2.7 ounces. The reasons for that I might go into, but it would take a very long time."

Mr. Baldwin: "It is only the water that runs out, and the mineral ingredient is left in the tie?"

Dr. von Schrenk: "Yes, left in the tie."

Mr. Baldwin: "At the same time one would seem to obtain good results when the tie is put in the track. I should imagine the result would be very much the same."

Dr. von Schrenk: "No, the trouble is, when you put it in the track, the water runs out with the chloride, whereas if you have allowed the water to evaporate from the tie during seasoning the chloride would not go out afterwards. You put a dry tie in the track, and the salt will not go out of those fibers. Whereas, if put in the track wet, you bring about an osmotic exchange between the solution in the tie and the water outside which will be equal to the zinc chloride walking right out of the tie constantly. You bring about a water connection between the water in the ballast which has no salt, and the water which has salt in the tie, and you bring about an equalization with the result that after every rain storm the water solution inside of the tie is weaker than it was before the storm."

Some Recent Practice in Rail Making.

The material which follows is almost the whole of a special report made by Mr. P. H. Dudley, consulting engineer and rail expert, to Mr. W. J. Wilgus, Chief Engineer of the New York Central Railroad. We have left out a few paragraphs which, while of use in developing the subject, are not essential. We have also omitted a few of the photographs referred to in the text of the report, and have cut down in size but have not reduced in scale those which are reproduced.

This is a brief report of my visit to the steel mills last summer, to make some rails for you, and to study their latest practice in the manufacture and colder rolling of rails. . . .

I visited first the Pennsylvania Steel Company's mill at Steelton, Pa. Direct metal from the blast furnaces is used for the converters, but little cupola metal being melted, when the mill is working under normal conditions. At the blast furnaces, the effort is made to produce iron with a definite quantity of silicon, about 1.10 per cent. for blowing in the converter. . . . The steel is poured into a ladle, carried by an electric crane, and the ingots are teemed in moulds standing upon cars. The ingot moulds are 17 x 20 in. on the base, and in 6 ft. only have a taper of about 1 in. This is decidedly advantageous, as the gases and slag can more easily rise to the surface of the steel before the latter sets on the sides of the moulds in three to four minutes.

At this mill the silicon contained in the steel is not high—.05 to .06 of 1 per cent. They consider this, for the class of ores which they use, to be a better practice than a high silicon content. At Scranton, and Chicago, a high silicon content is better.

The ingots, which set in about 15 minutes in the moulds, are then taken to the stripper, which lifts the moulds from the ingots on the car. The ingots then are taken directly to vertical heating furnaces, and charged from the top, requiring from an hour to an hour and 20 minutes for the heat to equalize. The heating is directly in charge of heaters, who heat the ingots fast or slow, as they consider best. This is the ordinary mill practice, of long standing, and is not the most advanced. The ingots then are drawn from the heating furnace, and taken directly to the blooming mill, or 22 passes, the drafts for each pass being light. Some of the ingots bloomed well, but others had numerous "skin cracks." The blooms were cut into two-rail lengths and then charged into horizontal re-heating furnaces. In 30 to 40 minutes, from the re-heating furnaces the blooms go directly to the roughing rolls, and are automatically handled until they pass through the finishing train.

So far as the heating of the blooms and the rolling mill practice is concerned, it is now practically the same as that which has prevailed for a number of years, the percentage of "seconds" being high.

The rails leave the last pass at a high temperature, and are cut to lengths by the hot saw, are cambered, and go to the hot beds to cool. These are inadequate for heavy rails. The shrinkage for 30 ft. 85 lb. rails was 7½ in. Under the straightening presses, many blows on the head and sides were required to straighten the rails. . . .

The structure of these re-heated rails [made from re-heated blooms—EDITOR.] is shown by photomicrographs. No. 1 coarse granular, and No. 2 coarse granular; both 85 lb. rails.

At Steelton the Pennsylvania Steel Company would like to roll only rails of 70 lbs. or less; the heavier sections going to Sparrows Point.

At the Maryland Steel Company's mill of the Pennsylvania Company, at Sparrows Point, the practice in some respects is quite different. . . .

The ingots on the cars, in about 15 minutes, go to the hydraulic stripper, are stripped, and then charged into vertical heating furnaces. The air and gas is so controlled that the heaters cannot rush the heating. The time required for equalizing the heat is an hour and a quarter to an hour and 20 minutes. It is automatic, under the control of the Mill Superintendent, and the heaters are frequently checked by photomicrographs of the steel, to prevent over-heating, causing a coarse granular structure.

This is really heat treatment commencing with the ingot. The ingots are 20 x 21 in. on the base, and with a taper of little more than 1 in. in 6 ft. The ingots as taken from the heating furnaces do not show dripping cinder. A nice scale is shown over the entire surface. This heat treatment of the ingots cut the "seconds" from 8 to under 5 per cent.; your rails running under 4 per cent.

From the heating furnace the ingots go to the blooming mill, and heat treatment is continued. After the structure of the skin of the ingot has been consolidated in two or three passes, then on the portion of the bloom which is to form the head of the rail a stream of water is forced, cooling this more rapidly than the other portions of the ingot. For an instant this portion becomes quite dark, but of course is immediately re-heated by the heat of the ingot, which dissipates the heat of the bloom in a more rapid manner than is possible by the ordinary blooming train. This feature of cooling the bloom is subject to a patent.

From the blooming train, the bloom goes to the shears, and is cut into lengths for rolling two or three lengths of rails, according to the weight of the section. The blooms are not re-heated, but one piece goes directly to the roughing train, and then to the intermediate train. The second piece is delayed a few seconds, then follows the first piece. This method prolongs the time of rolling each rail for colder working of the steel, without restricting the output.

The finishing train has but one pass, and is distinct by itself.

In all these operations, the metal is really being delayed and cooled as it passes through the various trains to the finishing train, the latter finishing at a low temperature, for the short shrinkages now desired.

There are several features of colder rolling of the rails, and shrinkages, which require considerable attention. In the operation at Sparrows Point, the metal for the rail section has been cooling from the time that it entered the blooming train until it passes through the finishing train, the metal being well worked and the structure fine.

The shrinkage limit itself prescribed for the last pass to govern the structure will not control it; while it may control the proper shrinkage, the structure may be so large in the central portion of the rail, that it is not broken up or refined in the last pass of the train. The structure of the metal must be checked and restricted in forming, long before the last pass, to make this fine

and uniform throughout the entire section of the rail.

Another feature of this method of heat treatment is that with our sections as already designed, the head being cooled so much faster, while the other portions contain sufficient amount of heat so that the rolling temperatures are very nearly uniform through the entire section, for cold rolling, it will not be necessary to change the form of section, when a proper heat treatment is observed during the manufacture of the rails.

From the hot saws, the rails travel a long distance to the hot bed, which spaces each rail 6 in. apart, for the ordinary 5 in. section; it would be slightly less for a section 6 in. in height. In making your rails, I had them slightly under-cambered, so that when cool, in 33 ft. they had a parabolic curve of about ¼ to ½ in. versed sine. The pressure to straighten these rails on the surface was not severe, nor that upon the side. Four to six light blows on the base were all that was required to straighten the rails smooth, with perhaps a like number upon the sides. As to the effectiveness of the method, you have noticed that already by the rails which have been laid in the track.

In testing the butts for the physical properties of these rails which were rolled so cold, it was at once noticed that the deflection sets were decidedly increased, over those which were rolled at a slightly higher temperature, or the structure had been fixed by composition. This refined structure effects the rail as a girder, and it is not desirable to lower the elastic limits so low as to have them exceeded by the rapid moving locomotives exerting the present tractive power as they pass over them in the track. The unit fiber strains in the base of the 5⅛ in. rails under the highest speed trains often reach 40,000 to 45,000 lbs. even when the track is in what may be termed the best condition. In the rails rolled in December, I obtained high physical properties, with fine structure.

To show you the structure obtained in the rolling of the rails, the photomicrograph marked "Non-granular, No. 4," in my questions for the International Railway Congress, shows an excellent structure. The one marked "Granular, No. 5," is one of the coarsest which we could find in the rails rolled in September. As already stated, the "Coarse Granular," Nos. 1 and 2, are from re-heated blooms. Cuts Nos. 6 and 7 show the average structure of your rails rolled in August. In the last rolling, cut No. 8 shows the structure of a rail 0.54 carbon and 1.20 manganese. This structure is what I want, and for that percentage of carbon and manganese, is excellent, has high elastic limits, considerable ductility, and will make a good surface wearing rail for the present wheel loads, as well as a girder. A piece of this rail I expect to have tested at Watertown, to find exactly its physical properties. . . .

Photographs Nos. 10 and 11 are from the first 100 lb. rails that were rolled in 1892, and laid in the tunnel. It had been in service 10 years, and carried over 150 million tons. A little piece was broken from the side of the head, owing to a blow-hole, and I etched it to see if we could trace anything further than the blow-hole. The structure in cuts Nos. 10 and 11 should be more uniform like the fine granular of No. 8, for the best wearing rail and girder. In cut No. 11 you will see a streak of slag, which is in the center of the cut. I did not make the first 100 lb. rails, and little attention was paid to the ingots. . . .

Cut No. 13 is from Barrow steel, 1873. This was a 4½ in. 65 lb. rail of the first 65 lb. section, and rolled in 1873. The Barrow rails were excellent wearing rails in the track, but broke more frequently than the Cammell or the John Brown. These were made from small hammered ingots, and by the structure it is seen they were rolled at a low temperature, near or below the "critical range."

Cut No. 14 is from a John Griswold rail, made at Troy, in probably 1874. This was from a small hammered ingot, and rolled very cold. At that date the rolling was done so cold that the light "trains" would break frequently in rolling the rails. Specimens of these rails have been sent to Watertown, for complete physical tests, and the carbons are to be determined by combustion, to see what they actually were. The mill test of the carbons, for technical investigations is not sufficiently precise, as it is combined in such a way that the color test does not show what it was, when rolled so cold.

The micro structure of the Barrow and the Griswold steel is interesting, from the fact that they were made from small hammered ingots and rolled cold. Part of this structure is due to the mechanical work from the hammer and the rolls. If these pieces of steel are reheated up to about 800 deg. C. this structure disappears, and a fine granular structure takes its place, and it is not possible to reconstruct the original structure as found in the rails by any method of heat treatment at present known.

This feature of the structure of the steel has not been investigated to any extent. The difficulties are not only great, but very expensive. I have sent a number of these old sections, and it is important to collect more of the old rails which have been in service, and send to Watertown, to the United States Government testing machine, to obtain complete physical tests of the early steel rails. One important fact is however well established—that with their moderate elastic limits in the metal of their sections they did not remain smooth in the track, but took permanent sets, so that the track could not be maintained smooth by the trackmen. The hammering of the early ingots actually welded a great many of the minute blow-holes that were in the steel, and by work being continued at a low temperature, an excellent wearing structure was obtained. But to attempt to repeat this structure in our present rails, without taking into consideration the elastic limits, as is generally done by engineers, a very serious mistake is being made. The physical properties of the steel were too low for girders. It is unnecessary for me to call you attention to the fact that in order to have the requisite standard of smoothness now required in your track, the metal of the rails must have sufficiently high elastic limits to withstand the strains of the present locomotives expending their large tractive effort. The work of the locomotives will increase, year by year, as well as some additional weight of axle loads.

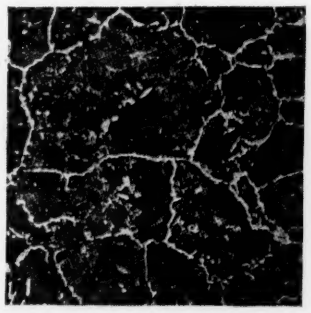
The consumer can determine better what physical properties are essential in the rails, to withstand the service, than anyone else who only gives the matter a superficial examination. Many of those who are now advocating colder rolling of the rails do not take into consideration what physical properties will be obtained in the steel.

The whole subject with most people seems to be a question of wear of the steel. While this is important, it is also necessary to have the requisite physical properties in the rails, to enable them to sustain the loads as girders, without taking permanent sets in the track under the traffic.

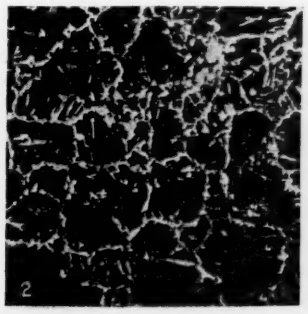
The problem, or series of problems, of making a rail adapted to the present service, is not as simple as many seem to think, either in a technical or commercial sense. It will require the co-operation of railroad officials to secure what is really needed in the track, for the present and future service.

Under present locomotives, expending so great tractive efforts, the intensity of pressure between the treads of the driving wheels and the surface of the rails, is from 2½ to 3 times as great as on the early steel rails, which were considered to wear so well.

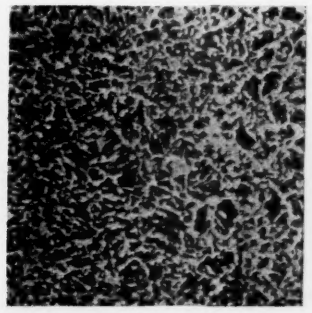
In the rails as girders, we can distribute the wheel loads by stiffness of the sections, but we must sustain the intensity of the driving wheel load pressures by only a slight increase of the bearing surfaces, by width of rail head, combined with higher physical properties in the steel. In regard to roll designing, there has been consider-



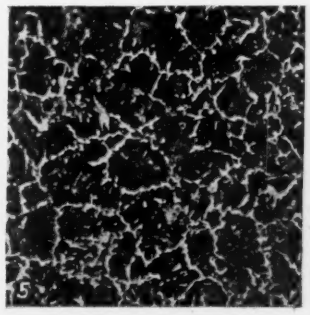
No. 1.—Coarse Granular; 85 lb. Section; P. S. Co., 1902. (Magnified 50 Diameters.)



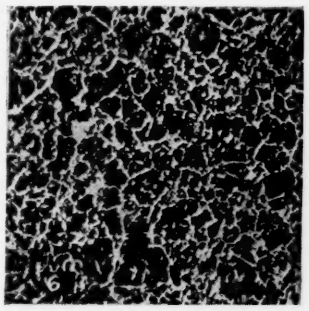
No. 2.—Coarse Granular; 85 lb. Section; P. S. Co., 1902. (Magnified 50 Diameters.)



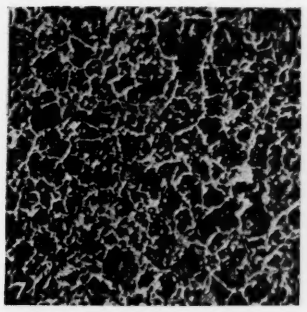
No. 4.—Non-Granular; 80 lb. Section, N. Y. C. & H. R.; M. S. Co., Sept., 1902. (Magnified 50 Diameters.)



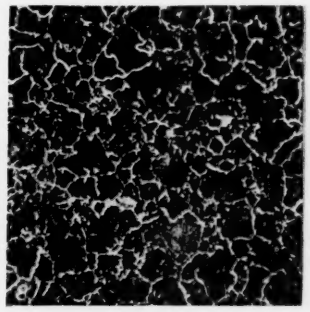
No. 5.—Granular; 80 lb. Section, N. Y. C. & H. R.; M. S. Co., Sept., 1902. (Magnified 50 Diameters.)



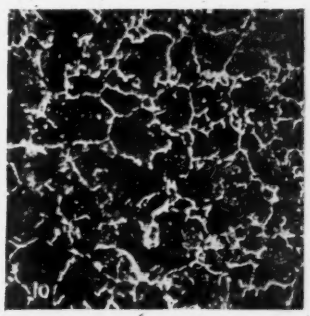
No. 6.—80 lb. Section, N. Y. C. & H. R.; M. S. Co., Sept., 1902. (Magnified 50 Diameters.)



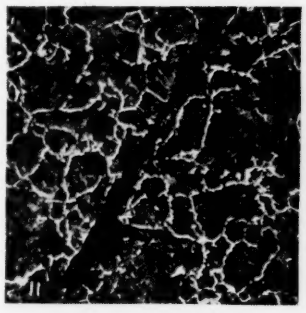
No. 7.—80 lb., N. Y. C. & H. R.; M. S. Co., Sept., 1902. (Magnified 50 Diameters.)



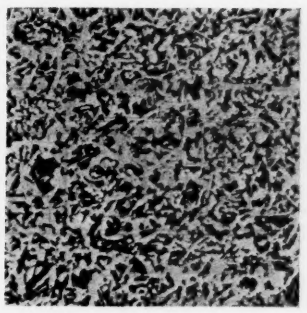
No. 8.—80 lb. Section, N. Y. C. & H. R.; M. S. Co., Nov., 1902; .54 Carbon and 1.20 Manganese. (Magnified 50 Diameters.)



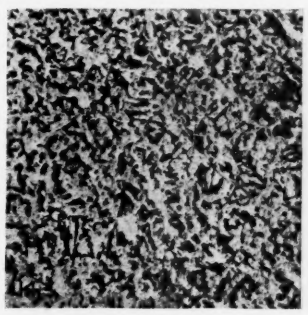
No. 10.—100 lb. Section, N. Y. C. & H. R.; L. I. & S. Co., 1892. (Magnified 50 Diameters.)



No. 11.—100 lb. Section, N. Y. C. & H. R.; L. I. & S. Co., 1892; Slag in center of cut. (Magnified 50 Diameters.)



No. 13.—65 lb. Section, N. Y. C. & H. R.; Barrow Steel; England, 1873. (Magnified 50 Diameters.)



No. 14.—65 lb. Section, N. Y. C. & H. R.; John Griswold Steel; Troy, 1874. (Magnified 50 Diameters.)

Microphotographs of Rail Steel.

able improvement in the past few years, and I find that it is possible to start a set of rolls the full height of the section, when new, and by careful dressing of the intermediate rolls, the height can be maintained practically the same for the different rolls. I am very much opposed to allowing them $^1/_{32}$ over or $^1/_{32}$ under the height of the section for dressing the rolls. I think if the railroads insist upon it the height of the rail can be kept practically that of the section, without increasing the cost to the mill, but care would be required in dressing the rolls. A description of the means necessary to do this is far too technical for this report, and it would need entire drawings of the rolls to show exactly what I mean; but I have had no difficulty in practically maintaining the height of the section for several rollings.

New Car Shops of the Lackawanna.

We gave in our issue of January 9 the general layout of the new car shops of the Delaware, Lackawanna & Western at Scranton, Pa. The location of the new shops while not at the geographical center of the road is very close to the traffic center, as a great portion of the traffic of the road originates in the anthracite coal regions in the vicinity of Scranton.

A summary of the principal buildings in the new shops is as follows:

	Area, sq. ft.
Mill, 90 ft. x 400 ft.	36,000
Blacksmith shop, 80 ft. x 300 ft.	24,000
Machine shop, 80 ft. x 180 ft.	14,400
Two freight car repair shops, each 150 ft. x 400 ft.	60,000
Paint shop, 60 ft. x 400 ft.	24,000
Total	158,400

In addition to the above are a power house, the designs of which are not completed, lumber shed, store and office building and several lavatories and minor structures.

A complete system of narrow gage tracks connects and enters the several buildings and standard gage tracks run through the lumber shed, mill, blacksmith and machine shops, car repair shops and paint shop.

Blacksmith and Machine Shops.—The machine shop is 80 x 180 ft. and forms a right angle extension to the east end of the blacksmith shop, which is 80 x 300 ft. The two shops are separated by a heavy fire wall in which are two 8 ft. and one 10 ft. arched openings. Both shops are similar in construction and have a clear height of 20 ft. beneath the trusses. The walls are of vitrified brick with concrete foundations, which is the same for all the buildings. The trusses are steel and the roof consists of 2 in. M. & D. boards covered with slag and rests on 6 x 12 in. yellow pine purlins.

The roof of the blacksmith shop is supported on 14 trusses spaced 20 ft. on centers. Every alternate pair of trusses is tied together by braces at the top and bottom. The top braces are 1⅛ in. round iron rods fitted with clevises and pins and crossed from side to side. The bottom braces are 3 in. x 5 in. x ⅜ in. angles and are not crossed. The ridge consists of a 10 in. I beam. A monitor 23 ft. wide and 9 ft. 4 in. high surmounts the peak of the roof for nearly the entire length. The roof of the monitor is supported on 6 in. x 14 in. yellow pine timbers 23 ft. long. These timbers are braced by 4 in. x 6 in. struts.

In designing the trusses a load of 55 lbs. per sq. ft., including the weight of the trusses, was assumed for the top chord and 1,500 lbs. at each panel point. The bottom chord is increased for a bending load of 6,000 lbs. at the center of any panel. The trusses rest on 14 in. x ⅝ in. x 22 in. bearing plates, which in turn rest upon blue stone blocks 12 in. thick.

The general scheme for the natural lighting of all the shops is substantially as shown by the elevations of the blacksmith and machine shops. This arrangement gives about 3,200 sq. ft. of lighting area for the blacksmith shop, or about .13 sq. ft. of lighting area per sq. ft. of floor space.

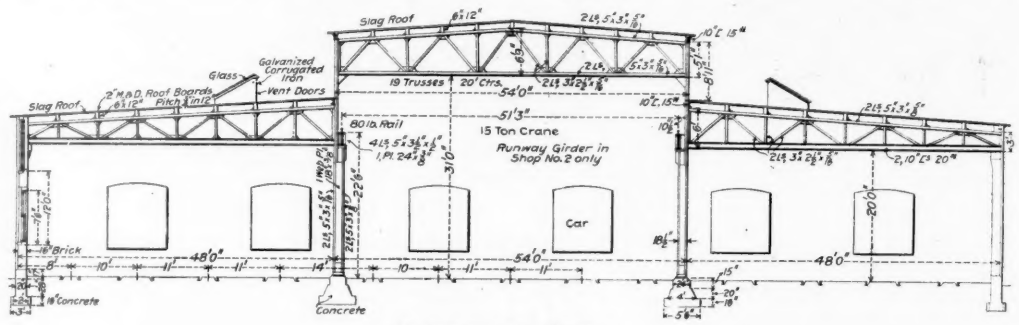
Mill.—The mill is north of the blacksmith shop and is 90 ft. x 400 ft. It is similar in general construction to the above described shops. A monitor 26 ft. 3 in. wide and 9 ft. 3 in. high surmounts the peak of the roof and is supported on steel trusses braced to the ridge of the main trusses, as shown by the accompanying engraving.

Freight Car Repair Shops.—There are two freight car repair shops each 150 ft. x 400 ft. and exactly similar in general construction. Each shop has three bays. The center bay is 54 ft. wide with a clear height of 31 ft. beneath the trusses, and each side bay is 48 ft. wide and 20 ft. beneath the trusses. The center bay of shop No. 2 (nearest the machine shop) is served by a 15 ton traveling crane having a span of 51 ft. 3 in. Two standard gage tracks run the length of each bay and afford room for 48 cars. There are narrow gage material tracks in each space between the car tracks, giving added facilities over the not unusual plan of one material track for each pair of car tracks.

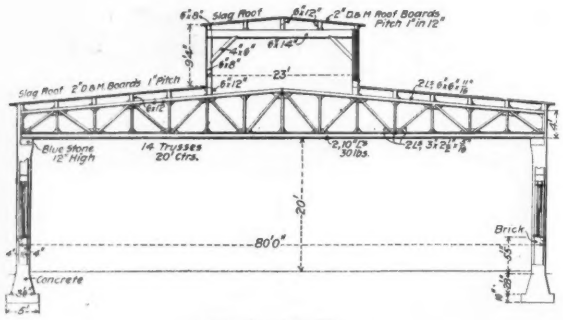
In the roof of each side bay are several lanterns with roofs of glass and sides of corrugated iron with vent doors therein.

Paint Shop.—The paint shop is about 375 ft. east of the car repair shops—a safe distance in case of fire. This building is 60 ft. x 400 ft., with a capacity for 30 cars. It is of very cheap construction; the framing is wood and the floor concrete. In case of fire it is quite certain that even a steel framed building would be seriously damaged, so that wood is believed to be the most economical material.

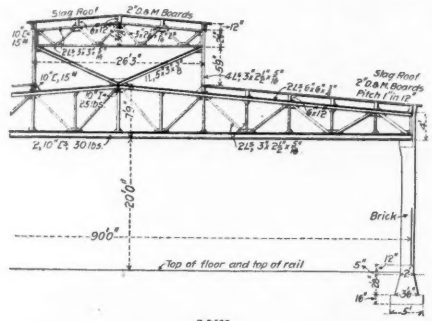
The center bay is 18 ft. 2 in. wide and 32 ft. high. The side bays are each 19 ft. 1 in. wide and 21 ft. high at the walls. The center columns are 10 x 10 in. timbers resting on concrete foundations, and the roof purlins are 4 in. x 12 in., and rest on 10 in. x 12 in. rafters.



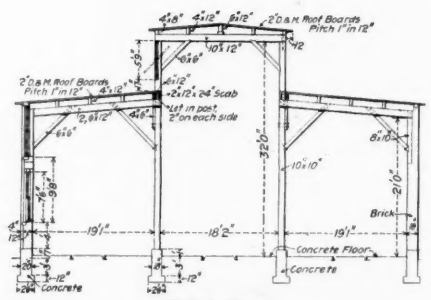
Freight Car Repair Shop.



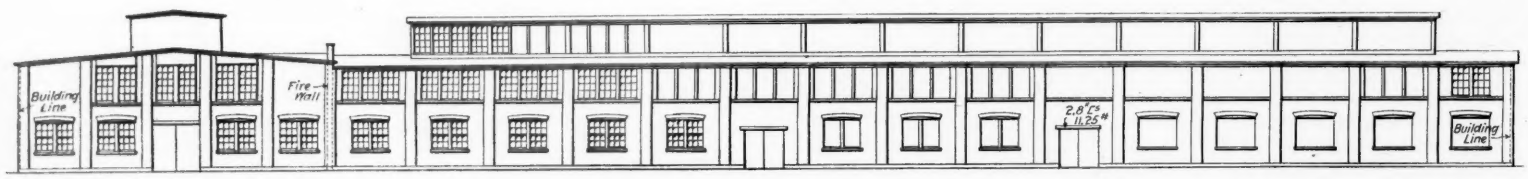
Blacksmith Shop.



Mill.



Paint Shop.



Elevation of Machine Shop and Blacksmith Shop.

New Car Shops of the Lackawanna—Scranton, Pa.

New York Railroad Commissioners' Report.

The State Railroad Commissioners of New York, Ashley W. Cole, Frank M. Baker and George W. Dunn, have issued the 20th annual report of the Board. The report begins, as usual, with a brief review of the general railroad situation. The improvements which are to be made in New York city by the New York Central and by the Pennsylvania are commended. But little new steam railroad has been built in the State during the year, there being only three lines more than 10 miles long. A score of increases in mileage, due largely to remeasurements, aggregate 15 miles and are off-set, twice over, by decreases in mileage from the same cause, aggregating 34 miles. The report contains the usual statistics of capital and earnings, of accidents and of grade crossings. The inspector of the Board has not investigated all of the important accidents, because he has many other duties. The Board has made frequent inspection of the Fourth Avenue Tunnel, New York city, since the collision of a year ago, and is still in correspondence with the company regarding further changes. In consequence chiefly of the tunnel collision the number of passengers killed during the year, 37, is much larger than the number in the preceding year (16), but the number of employees killed shows little change. The number of employees killed in coupling or uncoupling cars (11) is the same as in the year before.

The part of the report dealing with grade crossings takes up 32 pages, notes being given on each individual crossing dealt with during the last four years. The net result of the proceedings under the law of 1898 has been the abolition of 96 grade crossings, the practical closing of seven others by putting up farm gates and the changing of two street crossings to foot paths. At nine crossings the work is now under way, and plans have been approved for 20 at which the work will soon begin. The State has appropriated in the four years, 1898-1901, $400,000, but in 1902 there was no appropriation. The total number of grade crossings in the State is now 8,795; and there are 1,466 over or under grade.

The Board has made the usual careful inspection of the railroads. Complaints have been received of insufficient fences and of lack of cattle guards. Some of the companies claim that as cattle guards often fail to keep cattle off the track they are useless. The Board continues to recommend the blocking of frogs, switches and guard rails. One man was killed by catching his foot in a frog this year. The inspector reports that the physical condition of all the large steam railroads and most of the smaller ones has been decidedly improved. The frequent and extensive storms and consequent freshets materially damaged most railroads and compelled many of the smaller ones to spend all surplus earnings, and in some cases more, to keep them in safe condition for operation. Continuing, he says:

"Extensive changes in alignment have been made by some roads to reduce the curvature and make possible the lessening of maximum grades and making grades more regular. The standardizing of the roadbed and perfecting drainage have been given much attention. The replacing of the lighter bridges with stronger structures, made necessary by the increased weight of motive power, cars and loading, which has been in progress for the past few years, has been prosecuted with vigor by all the large roads and many of the smaller ones. The number of wooden bridges and trestles has been greatly reduced, they having been replaced with steel or iron structures, or masonry culverts and filling. The use of concrete masonry has become general and it is used by most railroads for abutments and piers to the small structures, and in many cases to the large ones. Concrete masonry is also being extensively used for arch and box culverts. The changing of open culverts and cattle-passes to covered structures by using a solid flooring of girders or rails and ballasting the track over them has been continued and a great number of openings to grade thereby eliminated. The renewal of cross-ties has been liberal; the use of tie-plates extended, and is proving very beneficial. Much new steel rail has been laid and in most cases heavier than the rail replaced. Nearly all stub switches, in the main track, have been replaced with

split point switches. Spring rail frogs are being used with practically all new rail laid, resulting in a smoother riding track. The protecting of the men engaged in the train and yard service by fitting the frogs, guard-rails and the heel of switches with foot-guards has been done on many roads. The condition of the fences has been considerably improved, but cattle-guards are being neglected by many of the small roads and some of the large roads are not giving them sufficient attention, claiming them to be unnecessary, as live stock is prohibited by law from being allowed to run at large. Claim is also made that cattle-guards are not effective. If cattle are allowed to graze about crossings they will sometimes find a way to get across the cattle-guards, but if being driven along the highway they nearly always turn aside when they come to a cattle-guard and will not cross it. The block-signal systems on the roads where previously used have been improved and extended and more of the roads are adopting some form of block signal. New interlocking plants have been installed governing the movements of trains in yards, cross-overs on double, or more, tracks, at grade crossings of railroads, etc., also adding to the safety of operating trains. New and greatly improved station and other railroad buildings have been erected at various places and necessary repairs to others given proper attention. The motive power and rolling stock have been increased. Locomotives are being constructed larger and of improved design. Passenger cars are being made stronger and the fittings more elegant. Freight cars are made of increased size and weight to carry greater loads. All cars in regular service are now equipped with automatic couplers, and all passenger cars and nearly all freight cars with air-brakes."

Concerning electric railroads the inspector says:

"The several new electric railroads which have been built and the extensions of existing roads which have been constructed in this State during the past year have been constructed in a first-class manner with proper weight of rails, good ties and broken stone or gravel ballast. Concrete culverts and openings on these lines have been put in. A large portion of the new construction has been on private right-of-way; in these cases the track has been properly ditched and right-of-way fenced in most instances. A large amount of new rail has been added to existing roads, replacing lighter rail. The improvements in the physical conditions of existing roads has been quite general throughout the State during the past year. At present there is very little 6-in. girder or 45-lb. 'T' rails remaining in the different city systems, and most of the companies owning these roads have made arrangements to replace this class of rail with heavier ones in the near future.

"The improvement in cars and equipment has kept pace with those made in track and roadbed construction. These improvements have been on the lines of larger cars, more comfortable inside furnishings; most of the cars which are now being added to the different systems are double truck, which adds greatly to the comfort of passengers, doing away with the end oscillation which is so disagreeable to passengers in the single-truck cars. Nearly all of the new double-truck cars placed in service during the past year have been equipped with power-brakes, and in a large number of cases this class of brakes has been placed on cars which were in service previous to this year. More attention has been given to the matter of cleaning cars; they are at present kept in a better condition on the inside and present a better appearance on the outside than formerly. There has been a marked improvement in the electrical equipment of cars, motors of a greater horse-power capacity have been placed on them, which has resulted in avoiding the numerous delays caused by the breaking down of over-loaded motor equipments.

"Nearly all of the leading railroad systems and a number of the smaller ones have recently reconstructed their power plants; in a number of cases the power has been centralized by combining the equipment of several plants in one. There has been a change in the method of transmission of power; several of the larger systems are at present transmitting power from a central station to transformer stations, located at different points on the systems; this transmission from the power-house to the transformer station is made at voltages varying from 6,000 to 23,000 volts. A number of the suburban lines in the State are supplied with power which is transmitted from water plants located some distance from the lines. This transmission of power is in most cases made over lines which are located on the highways. The transmission of power at the high voltages used over lines on the highways adds an element of danger to the operation of electric railroads. The safety of the public requires that lines carrying currents of this character should be properly constructed and maintained, and, where possible, should be located on private right-of-way.

"The methods of operation on the different electric railroads have been greatly improved during the past year. This is especially true of all of the city systems. There has also been an improvement in the methods of operation on the suburban roads. Cars on five of the larger suburban systems are now operated under the authority of train despatching systems. Train orders on one of these roads are issued by means of a telegraph system, on the other roads by telephone. These improvements in safety appliances and methods of operation should be continued."

The Commission renews recommendations heretofore made concerning the operation of street railroads, and in particular urges upon the companies that oil tail-lights be provided on all cars operating on suburban lines. Many rear collisions would have been avoided were the cars equipped with these lights, and in a great number of instances the Board has recommended directly to a company that the lights be provided, which recommendation has been complied with. Not alone on suburban lines should the lights be provided, but in all cases where the streets are not well lighted.

The Signal Department of the Lackawanna.

The Delaware, Lackawanna & Western established its signal department on April 1, 1900, and Mr. A. H. Rudd, the signal engineer, formerly of New York, New Haven & Hartford, was appointed on that date. A brief note of the liberal expenditures which have been made in this department of the Lackawanna, and a few of the statistics showing the energetic work that has been done, were given in the *Railroad Gazette* of November 14 last, page 870, (in which number also will be found Mr. Rudd's statement of signaling principles, which he made for the Railway Signaling Club). Signal engineers and operating officers will, however, be interested in a fuller statement of the details and of the rapidity with which the improvements have been made, and to show these features we give the accompanying table. It will be observed that in the figures showing the final total number of signals in service, each two-arm semaphore is counted as two, though in some of the other items such a signal is counted only once. In the statement of the number of signals worked by wireless circuit, the total, 870, includes, apparently, both the home and the distant arms of the signals in the sections operated by this system.

It will be observed that the interlocking is classified as mechanical, electro-pneumatic and electric. The electro-pneumatic plant includes 46 signals and 82 switches; and there are worked also from this power five block signals, not included in the total number of block signals shown in the table. The all-electric interlocking plant is at a draw bridge.

In 1901 green glasses for the all-clear indication were put into all signals, and the use of white for the all-clear night indication was abandoned; at the same time the distant signals were fitted with yellow glasses for the "caution" indication. Interlocking plants not maintained by the Lackawanna road are not shown in the table.

PROGRESS OF SIGNALING ON THE DELAWARE, LACKAWANNA & WESTERN.

	Apparatus in use on— April 1. 1900.	Jan. 1. 1901.	Jan. 1. 1902.	Jan. 1. 1903.
Banjo, home block signals (stop)	110	104	97	64
Banjo, home block signals (caution, heavy up grades)	10	8	8	4
Banjo, distant block signals (caution)	12	13	19	18
Banjo, home and distant block signals	0	0	2	16
Banjos at trolley crossing	2	2	2	2
Banjos for station signals	0	0	1	2
Total banjos in service	134	127	131	122
Electric semaphores, home block signals	0	60	73	77
Electric semaphores, home and distant block signals (2 arm)	0	1	123	303
Electric semaphores, distant block signals	0	1	4	30
Electric semaphores, distant interlocking signals	0	11	23	51
Total electric semaphores in service	0	74	346	764
Electro gas, home and distant block signals (2 arm)	....	....	....	24
Total electro gas signals in service	....	....	....	48
Total automatic signals in service	134	206	482	939
Automatic signals (normal danger)	132	11*	40*	52*
Automatic signals (normal clear)	2	195	442	887
Slotted home interlocking signals (semi-automatic)	0	24	52	71
Number of signals operated by wire circuit	127	63	19	4
Number of signals operated by wireless circuit	6	136	344	870
Number of signals operated by wire and track circuit combined	0	31	21	65
Banjos removed during the year	0	19	13	50
Banjos re-erected during the year	0	12	15	41
Semaphores removed during the year	....	....	....	42
Semaphores re-erected during the year	....	....	....	43
Main line switches protected by automatic signals	146	243	394	496
Number of Hall switch instruments	130	130	142	79
Number of Union switch instruments	16	113	255	411
Number of Taylor switch instruments	....	....	....	6
Number of miles of single track protected by wire and track circuit combined	1.4	1.7	1.7	4.7
Number of miles of double track protected by wire circuit	29.58	14.47	1.6	0.0
Number of miles of double track protected by wireless circuit	0.82	45.9	95.6	183.9
Number of miles of double track protected by wire and track circuit combined	.0	3.72	11.13	9.2
Total miles (one track) protected by automatic signals	64.2	129.88	218.36	390.9
Number of track circuits for signals and bells together	250	390	585	652
Number of track circuits for bells separate and outlying	4	20	39	30
Number of preliminary track circuits for warning bells, etc	6	8	5	7
Total miles track circuits, all kinds (one track)	67.20	141.18	235.84	403.0
Number of switch indicators	110	11	4	8
Number of annunciators	0	10	10	10
Number of train describer sets	1	4	4	4
Number of cabin warning indicators	38	44	119	156
Number of motor generators	0	1	2	2
Number of electric locks	9	7	30	61
Number of crossing bells operated by track circuits entirely	8	15	25	34
Number of crossing bells operated by track instruments entirely	88	82	72	67
Number of crossing bells operated by part of each	0	3	3	0
Total crossing bells	96	100	100	101
Approximate total of other bells at stations, offices, etc	60	70	75	112
Number of track instruments in use	393	384	305	278
Approximate number of push buttons in use	10	35	40	40
Number of cells of storage battery for signals and switches	0	14	70	70
Number of cells of gravity battery for signals and bells	2,320	3,420	1,636	1,955
Number of cells of Waterbury battery for signals and bells	0	672	664	366
Number of cells of Gordon battery for signals and bells	170	872	492	53
Number of cells of Edison battery for signals and bells, Type "R"	370	1,484	220	71
Number of cells of Edison battery for signals and bells, Type "RR"	0	0	807	1,090
Number of cells of Edison battery for signals and bells, Type "SS"	0	0	3,534	7,086
Number of cells of dry battery	....	....	....	12
Number of cells of gravity battery for track circuits	541	872	1,640	2,198
Number of cells of Waterbury battery for track circuits	....	....	....	8
Number of cells of Gordon battery for track circuits	....	....	....	24
Number of cells of Edison battery for track circuits, Type "R"	....	....	....	0
Number of cells of Edison battery for track circuits, Type "RR"	....	....	....	91
Neutral polar relays	10	117	291	0
Pole changing relays	10	120	96	0
Neutral polar pole changing relays	0	0	108	0
20 ohm relays	....	....	....	47
500 ohm relays	....	....	....	87
600 ohm relays	....	....	....	50
Union universal relays	....	....	....	439
Hall track relays	0	0	167	290
Hall hold clear attachments for banjos	....	....	....	83
Slow acting relays	0	73	199	165
Slow acting slots	....	....	....	222
Signal and overlap relays (old style)	206	149	30	0
Low resistance relays (substitute for compound)	0	9	17	4
Interlocking crossing bell relays	180	170	101	101
Plain crossing bell relays	13	31	64	27
Compound relays	21	6	6	0
Odd relays, 8 and 12 ohm, etc	55	93	50	67
Switches to control distant signals, etc	0	9	38	73
Draw bridge circuit closers	0	2	4	1
Circuit closers on machines	15	20	12	12
Circuit closers on home signals	0	13	48	97
Number of cut sections	0	0	141	35
Number of mechanical interlocking plants maintained by D., L. & W.	17	19	26	30
Number of working levers	222	281	402	527
Number of spare levers and spaces	38	35	45	74
Total	260	316	447	601
Number of interlocking distant signals (11 replaced by electrics)	27	30	19	19
Number of interlocking home signals	75	83	107	125
Number of interlocking dwarf signals	26	72	115	159
Number of interlocking pot signals	10	5	11	4
Number of interlocking derails operated	30	78	90	112
Number of interlocking switches operated	43	51	92	119
Number of movable point frogs operated	0	2	6	6
Number of detector bars operated	71	134	197	256
Number of facing point locks operated	28	52	110	161
Number of switch and lock movements operated	46	68	62	60
Number of draw bridge locks operated	20	20	16	16
Number of draw bridge couplers operated	0	0	8	8
Number of electro pneumatic interlocking plants	0	1	1	1
Number of working levers	0	34	36	36
Number of spare levers	0	13	11	11
Number of electric interlocking plants	....	....	1	1
Number of working levers	....	....	8	8
Number of distant switch signals (took out 2; put in 4)	6	6	9	11
Train order signals (semaphore type, double arm)	1	1	88	158
Train order signals (semaphore type, single arm)	2	2	8	8
Train order signals, Swift's	....	....	....	17
Special signals at grade crossings, etc	6	12	14	13
Number of interlockings extensively repaired during year	....	2	7	2
Number of interlockings rearranged	....	1	3	1
Number of interlockings entirely new	....	1	5	7

*At interlockings.

The Western Railway Club.

Two of the three papers presented at the January meeting of the Western Railway Club were on subjects of especial interest to operating officers. Most of the rather brief discussion on these interesting papers consisted of written contributions. It is to be regretted that the attendance at the meeting did not include a larger representation from the operating departments in order that a full discussion of the papers might have been had.

AVERAGE LADING OF FREIGHT CARS.

A written discussion on Mr. McPartland's paper on "Average Lading of Freight Cars and Tons Lading of Freight Trains" was sent by Mr. C. P. Converse, Chief Clerk to the General Agent of the Freight Department of the Canadian Pacific, Chicago, in which he asserts that there is hardly anything in railroading where more money can be saved than in empty car and train mileage. But the traffic and operating departments must co-operate to accomplish this; unfortunately, and for various reasons cited, there is much to discourage agents and others in the traffic department from making a showing in the consolidation of merchandise shipments into the fewest possible cars.

Unfortunately the subordinate heads in railroading are too apt to lose sight of the general good of the road as a whole in an effort to make a success of their own special departments. This being the case, the operating men aim to transport the traffic at the lowest possible cost without much regard to the wishes or requirements of shippers; while the traffic men want the freight rushed through regardless of expense; and the local agent does not care how it goes so long as his labors are not increased. To overcome this, a happy medium should be arrived at by giving good steady service and by making fair time all the time. The average shipper would prefer fair time that could be relied upon rather than to have some of his freight come through in exceptionally good time and the balance delayed.

On many roads, and on parts of others, good results could be obtained by arranging certain zones or districts to which less than carload shipments could be consolidated, and possibly by using stickers having a different color for each district and the final station number shown thereon in large plain figures, considerable time and trouble could be saved in loading and unloading. It might also be a good idea to have one or more prizes offered for the agents showing the best average loads per car each month and a circular be gotten out each month showing the average of each agent which could be posted in all stations. This would act as a stimulus to all agents to use more care in loading freight. This plan is similar to that adopted by many roads with respect to locomotive engineers for their showing with respect to use of coal and other locomotive supplies and which I believe has been very successful, as it works on the men's pride.

Mr. Converse suggested that the practice followed in the treatment of agents could be considerably improved; many of the discouragements to which they are subject could be corrected and these representatives given all possible encouragement to develop them into "freight-getters."

Regarding carload shipments, it was said that the established minima have not been increased on the various classes of freight correspondingly with the increased capacity of freight cars. While some commodities could not be raised above the present minimum weight established, there are a large number that could, and it would appear that graded carload rates could be arranged for different sized cars.

Much of the opposition to the increase of minimum carload rates comes from shippers, principally on the ground that their patrons would not be able to use a whole carload if it were made any larger than it is now; but that opposition has always existed, even when the cars were only of 10 tons capacity. The increase of carload minima should keep pace with the increase in car capacities, both for the protection of carrier and shipper.

Private freight equipment is a source of unnecessary expense to railroads because of the heavy mileage charges and the empty-car mileage caused by the necessity for returning these cars home promptly.

THE RAILROAD SUPPLY CAR.

In a written discussion of the paper on "The Railroad Supply Car," by Mr. J. P. Murphy, Mr. A. L. Sanger, Purchasing Agent of the Evansville & Terre Haute, does not agree with the paper in the jurisdiction it proposes to grant the man in charge of the car as it would lead to possibility of conflict between store department and superintendent. Also it is suggested that it would not be altogether wise to grant to a man drawing a salary of $50 a month the power which the paper proposes, the opinion being expressed that salaries and calibre usually find their level.

Mr. Chas. D. Neahr, General Storekeeper for the Grand Rapids & Indiana, in a written discussion urged the objection to the supply car that since it is not intended that it shall take care of all the supplies sent out, its adoption requires the work in the storehouse to be divided into two systems, necessarily creating more or less confusion and increasing the possibilities of error. Also, as the desirability for adoption of any new feature or system depends to a great extent upon its capacity for saving money over the practice in vogue, the various expenses attendant upon the adoption of the supply car system must be carefully considered. One of these would be the redistributing storehouses, which if maintained as conditions would seem to require, would incur considerable added expense and trouble to the store department.

Cast-Iron Wheels To Meet To-Day's Requirements.*

The brake-shoe has very little direct effect upon the hard chill of the cast-iron wheel tread so far as actually cutting, or wearing, into the wheel tread or flange is concerned. There have been, occasionally, instances where cast-iron wheels have been cut into and grooved by the brake-shoe, but such cases occur generally with wheels that are nearly worn out or that are very lightly chilled. In either case the slipping on the rail or the flange thrust in combination with the heat produced at the shoe face softens the chill in the wheel, permitting the harder, or tougher, material in the shoe to cut. Cases occur where the chill does not extend clear across the wheel tread, and then a chilled-face brake-shoe bearing all across the wheel tread may cut into the softer portion. Some cast-iron wheels have in this way been grooved along the outer tread. Investigation generally discloses the absence of chill in those parts of the wheel cut into by the shoe.

I have noticed cast-iron wheels grooved by wrought-iron shoes. The hard metal flowed and burned fins on the side of the shoe and these cut deep furrows in the wheel tread. Examination of these damaged wheels showed them to be practically worn through the chill by continued service and sliding on the rail where the shoe had cut inside the limits of rail wear, and outside of these limits there had been but very little chill at the start. These observations of cut cast-iron wheels were made over 10 years ago, and the road has long since discarded the practice of riveting a strip of wrought-iron on the brake head, this to take the place of a brake-shoe.

Some years ago the Southern Pacific made an exhaustive test of cast-iron wheels in their mountain service for the purpose of determining the best design of wheel for their use, and in the course of the trials used cast-iron and wrought-iron brake-shoes, and many more wheels of all designs were cracked under the wrought-iron shoes than under those of cast-iron. The braking loads were the same in all cases. The only reason that can be given for the apparent severer action of the wrought-iron shoe is that the greater retarding power of this kind of shoe heated the wheel more highly than the softer cast-iron shoe. Under the conditions of freight service there is about 15 per cent. greater retarding effect with wrought-iron than unchilled cast-iron, which will account for the greater heat. I refer to this test now because I have heard the results quoted as a reason why wrought-iron is unsatisfactory for use in a brake-shoe to be used on the chilled wheel.

The most desirable metal to use in the brake-shoe is unchilled cast-iron and our efforts as manufacturers have always been directed towards maintaining, as much as possible, the grinding effect and rolling action between the shoe face and the wheel, which is only possible with a large proportion of unchilled cast-iron in the shoe face. The final temperatures of the wheel and of the shoe are much less when a portion of the work changed into heat has been dissipated by the particles thrown off in an incandescent condition by grinding from the shoe face. I think it is impossible that a hard spot on the face of an ordinary brake-shoe should cut into the tread of a well made cast-iron wheel. By "well made," I mean with a good strong chill where the brake-shoe acts. The brake-shoe is continually against the wheel when the brakes are applied, while any point on the wheel is but intermittently in contact with the shoe; the smaller body of the brake-shoe must in consequence become more highly heated than the larger volume of the wheel, and hence any hard spot, or point, on the shoe would be destroyed by heat before the cooler chilled metal in the wheel tread is cut. Of course, flowed steel or wrought-iron as before noted, will cut into the unchilled metal of the wheel body regardless of the temperature, but it will have no effect on the chilled iron. During all my experience I have found no records of cast-iron wheels being directly injured by the brake-shoe, so long as the wheels were in good condition otherwise.

Indirectly, the brake-shoe may affect a cast-iron wheel to such an extent as to make it necessary to remove the wheel from service. The brake-shoe is the medium through which the energy stored in the wheel, due to rotation and load carried, is transformed into heat. The rate at which this change takes place is the most important factor in determining the final temperature of the shoe and wheel. The rise in temperature of the wheel due to the action of the brake-shoe on it depends upon the amount of work done by the shoe upon the wheel and the time in which the work is done. Hard cast-iron is a metal which appears to have a lower rate of heat conductivity than soft cast-iron. The chilled iron does not absorb or conduct heat readily, and this condition produces the tendency for the wheel to crack; the wheel does not expand freely when heated rapidly. The cracks in the wheels are very small and fine at first but, in hard cast-iron as in steel, these cracks, once started, continue to enlarge under the repeated heatings, coolings and poundings which the wheel receives, especially in winter, until finally fracture of the wheel occurs.

Any person who has examined the face of a worn, chilled brake-shoe must have observed the many cracks on the chilled face and the absence of cracks on the adjacent unchilled parts. Cracks in the chilled or hard iron brake-shoes result in total fracture unless precaution is taken to hold the parts together regardless of the cracks. Brake-shoe makers have resorted to the steel plate reinforcement at the back of the shoe, which is so designed as to anchor the cast-iron body firmly to the back. The cast-iron may crack, it is sure to do so sooner or later, but the parts cannot get away from the back, which is made of other metal, and the back cannot be broken. The brake-shoe to meet to-day's requirements has a steel back and is a success regardless of the fact that the extra durability for wear in the brake-shoe, which is required by many railroad officials, necessitates the use of a grade of iron which is sure to be cracked under the conditions of modern service.

Very few, if any, cast-iron wheels which are acted upon by only the brake-shoes are found to be cracked or shelled out on the outer tread. The trouble always appears within the limits of rail action. Heat is very destructive to cast-iron wheels and it is the heat generated in the wheel tread by the brake-shoe, or at the point of rail contact, by reason of the brake-shoe retarding effect that, sooner or later, causes the wheel to fail.

The thermal test, adopted by wheel makers and railroads generally, subjects the wheel to rapidly heating it to a high temperature, and this rapid rise in temperature develops weak points in the design or material which might cause failure in service. Each application of the brake-shoes to bring the car to a stop, or to control its motion on a grade, subjects the wheels to a practical thermal test varying in intensity as the period and rate of application, and after each application of the shoes the wheel is subjected to a rapid rate of cooling.

It would be interesting to note the effect upon a cast-iron wheel of repeated thermal tests alternated with quick cooling. A better indication of the possibility of the wheel meeting to-day's requirements might be obtained by this experiment. The continued application of the brake-shoe may so heat the wheel tread as to cause circumferential fracture. I have been told that in a shop test a wheel flange has been broken off by the continuous action of the brake-shoe upon the outer tread, while the flange may be comparatively cool. Should the truck be out of square and a wheel be forced against the rail on one side, the flange of the wheel may become highly heated while the outer tread of the wheel is comparatively cool. It is this continued change of conditions, first on one side of the wheel tread and then on the other, aggravated by the blows on top and against the side of the rail, that causes the circumferential cracks and causes the flanges to be broken off; these adverse conditions are greatly aggravated by the higher speeds and loads of to-day. Again, too hard application of the brake-shoe checks the wheel's motion and causes it to slide upon the rail, generating intense heat at the point of rail contact, destroying the hardness and life of the chill at that point and cracking the surrounding metal. The slid-flat wheel is permanently injured.

When the brake-shoe retards the motion of the wheel to the extent that the distance traversed by the car exceeds the distance rolled by the wheel a high rate of heating occurs due to the imperceptible slip (so to speak) of the wheel along the rail. This will crack the chill along the limits of rail contact but will not burn it, as in the case of the slid-flat spot. Pounding on the rail causes the cracked metal to fall off. This effect is the result of the combined action of the shoe and rail and always occurs within the limits of contact of the wheel with the rail. These evil effects are directly due to the brake-shoe, as nothing of the kind would occur on the surface of a cast-iron wheel which is simply rolled along on the rail under the heaviest loads. These effects are unavoidable so long as the wheel is controlled by the tread-bearing brake-shoe. Slid-flat and shelled-out treads were of common occurrence in cast-iron wheels under the lighter and slower service of the past and must of necessity increase under the more severe service of to-day. Something can be done, doubtless, in the way of more careful handling of brakes, but the demands of modern service call for heavier and stronger wheels and the wheel makers are well aware of this fact.

Putting two brake-shoes on a wheel has been suggested as one means of reducing the evil effect of the shoe action on the cast-iron wheel, but beyond the fact that a little more heat would be taken care of by the additional shoe there can be no advantage in so doing. Also, there can be obtained only little advantage by increasing the size of the brake-shoe. The use of a flanged brake-shoe would help matters somewhat because such a shoe would tend to heat more uniformly the wheel tread and the flange. The brake-beam would then distribute the side thrust equally between both wheels on the same axle. To use a flanged shoe successfully, it will be necessary to have the cast-iron wheel ground to a true circle and the flange ground to a uniform section. The particular advantage of this style of brake-shoe is that it occupies the same position on the wheel tread and avoids the excessive side thrust against the flange, which side thrust may be a factor in flange breakage.

Freight trains are run frequently on passenger-train schedule and the same necessity exists for their brakes being adjusted on the basis of the total wheel load as exists with the passenger trains on the same tracks with

*Abstract of a paper presented to the New York Railroad Club, Jan. 16, 1903, by Mr. F. W. Sargent.

which the freight trains are run. If cast-iron wheels are burned when the brakes are applied on the basis of the light weight of the car, what will be the result if the braking load is increased to the loaded car basis? As time is the factor in stopping a train which affects the wheel and shoe (and the shorter this time the greater the trouble) it may be argued that, as freight trains carried on cast-iron wheels are seldom stopped in a very short interval of time and by the emergency application, there is little danger to be apprehended. This is all very true if the speeds are slow, but to-day's requirements call for increased speed and the difficulties are magnified as the square of the speed. The control of a freight train on a grade is gradual, though constant, and the comparatively long time of application permits a great deal of heat to be radiated. Increase of load means increase of heat at the brake-shoe even though the braking load is based on the light weight of the car. Loads are ever increasing while the light weight of cars varies very little. Therefore, the heavy cars will call for more brake application throughout the whole train and the wheels will suffer. Since the advent of the 100,000 lb. loads, transverse cracks have appeared in the cast-iron wheel which seem to be due to the higher rate of heating than that which occasions their shelling out along the limits of rail wear, the excessive heating of the wheel literally causing it to burst by reason of circumferential expansion—all of which appears to be due to the increased effort in braking the increased load.

Keep down the braking load and the necessity of much braking effort and you will help the cast-iron wheel; increase either the speed or load, or both, and the wheels will suffer if they are not proportionately strengthened. For the same amount of braking in the same period of time, I believe that a shoe of soft cast-iron will heat the cast-iron wheel to a less extent than any other shoe in common use, for the reason that considerable heat must be dissipated in the particles which are thrown off the shoe in an incandescent state. Apparently the softer cast-iron allows the passage of heat through the body of the shoe, whereas the more ductile, flowing metals, as wrought-iron and mild steel, as well as the harder and more dense chilled and hard cast-iron, apparently hold back the heat and maintain a higher temperature at the face of the shoe and consequently a higher temperature at the wheel face. As brake-shoe makers, our efforts have been directed towards retaining, as much as possible, the soft cast-iron effect in the brake-shoe, toughening it by inserts to resist rapid wear as well as to increase the grip on the wheel; we have been compelled, however, in order to meet to-day's requirements, to reinforce the cast-iron body by the addition of a steel back as a safeguard against failure in the shoe by cracking. The cast-iron car wheel cannot, unfortunately, be reinforced in the same manner as the brake-shoe and the wheel makers can only add more weight in the rim and plate and improve the quality of the metal. The records of test on cast-iron wheels under the 80,000 lb. and 100,000 lb. capacity freight cars indicate that the cast-iron wheel of to-day is equal to the increased demand when the braking load is based on the light weight of the car. What will happen to the cast-iron wheel from the brake-shoe acting with a load based on the total weight of the loaded car is a question yet to be decided.

In conclusion, and returning to the consideration of the cast-iron wheel to meet to-day's requirements from the standpoint of the relation between the brake-shoe and the wheel, the use of a flanged brake-shoe—bearing on the wheel tread and flange, the shoe supported against failure by a steel back—will materially assist the successful operation of the best cast-iron wheel that can be made.

Discussion.—The general tone of the discussion which followed the reading of the above paper was favorable to the cast-iron wheel and that the most frequent cause for complaint was due more to the brake-shoe than to inherent defects in the chilled wheel. Along this same line it was stated that even the steel tired wheel has developed many of the defects, such as shelled tread, etc., that are frequently found in the chilled wheel.

It was suggested that a flanged brake-shoe would no doubt be much less severe in its action upon the wheel than the plain shoe for two reasons: First, it would always remain in its proper position and not wear unevenly or bear in spots; secondly, the heat developed would be spread over a greater area and hence its intensity would be reduced. This latter point is of especial importance as it has been shown by experiment that the transverse cracks which appear in the face of the chilled wheel are due to the heat developed and not to the pounding on the rails.

Another point which was strongly emphasized was the cause of many slid flats. These are frequently the result of incorrect centering or defects in moulding which produce an oval wheel. Such imperfections are cumulative in their effect—the result being that the smallest spot will soon develop into a serious flat.

One member thought that the cast-steel wheel was destined to replace all others in freight service, and that as improved methods of manufacture are gradually introduced, its cost would not greatly exceed that of the chilled iron wheel.

The Westinghouse Electro-Pneumatic Train Control System.

One of the advantages claimed for the electric railroad is the rapidity with which maximum speed can be obtained. This is largely due to the fact that with this system of propulsion, motor cars can be interpolated in the train and thus utilize a large percentage of the paying load for tractive adhesion. This calls for a highly perfected system of train control if maximum efficiency is to be sought.

In an ideal system of train operation the weight of the train and the capacity of the motors would increase or decrease in direct proportion to the paying load. The control system described herewith provides a means by which these ideal conditions can be closely approached. In this system several or all of the cars in the train are equipped with motors of moderate size, and a controlling device is provided, by which all motors on a train can be operated simultaneously from the forward car and permits trains of practically any length to be made up to suit varying service conditions.

The Westinghouse multiple control system involves the use of (1) compressed air for moving the controlling apparatus, (2) electro-magnetic valves governing the admission of air to the several cylinders, and (3) low voltage circuits for controlling the action of the magnet valves. Connections for the low voltage magnetic circuits are the only ones which have to be established between the cars of the train, no air connections being required outside of the ordinary brake hose. The complete controlling equipment for each motor car consists of one controller with operating head; one or two motorman's multiple control switches; one railroad type circuit-breaker; one set of connectors; a small storage battery, and an auxiliary air reservoir. The controller is of the series-parallel type and is similar in design to the ordinary form of hand controller which has been in successful use for many years. It consists essentially of two drums, which revolve in bearings mounted upon a substantial cast-iron frame, and stationary contact fingers which make contact with points upon the revolving drums. The large or main drum opens the main circuit and makes the motor and resistance combinations. The small drum reverses the motors.

A multiple control switch is placed at one or both ends of each motor car, and by means of the one at the front of the leading car the motorman directs the action of the controllers on all the motor cars in the train.

Figure 1 shows diagramatically the operating head, circuit breaker, multiple control switches, batteries and complete wiring connections for one car as generally installed. All of the contacts on the drum of the multiple control switch, the development of which is shown, are electrically one—the function of this switch is merely to connect the low voltage magnet circuits to the positive of the battery. All of the magnets with the exception of the limit switch magnet have one terminal connected to the common return B—which is in turn connected to the negative terminal of the battery.

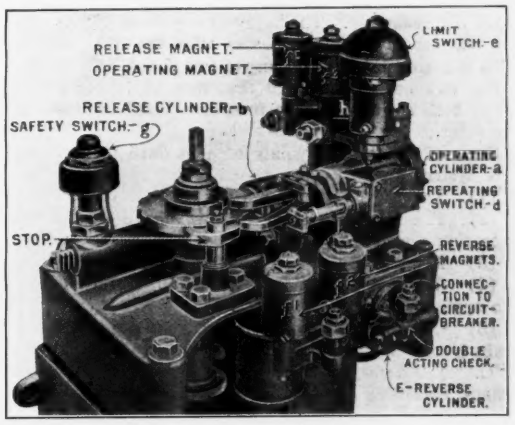


Fig. 2.—Operating Head—Westinghouse Electro-Pneumatic Control System.

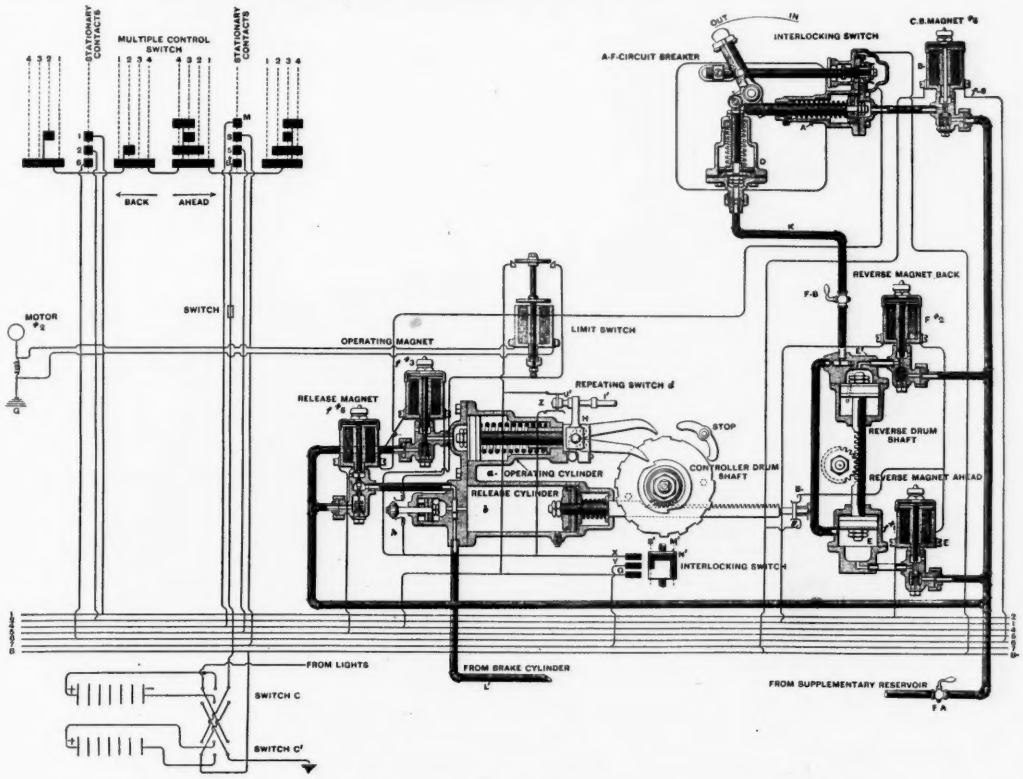


Fig. 1.—Diagram of Connections for Westinghouse Control System.

When the multiple control switch is moved to the right so that the point marked 1 on the drum development corresponds with the stationary contacts, 6 is connected to B +; this completes the battery circuit through the circuit breaker magnet f^6 which immediately opens the air valve admitting air to the cylinder A. The air acting upon a piston in this cylinder compresses a spring and opens the circuit breaker.

When the multiple control switch drum is moved to position 2; 6, 1, and 5 are connected to B +, thus completing the battery circuit through magnets f^6, f^1 and f^5.

Magnet f^1 opens the valve admitting air to one of the reverse cylinders turning the reverse drum to the "ahead" position, air then passes from the reverse cylinder through the pipe connection K to the cylinder D where, acting upon a piston, it throws in the circuit breaker. Air is prevented from passing from one reverse cylinder to the other by means of a double acting check located at the end E'. Magnet f^5 closes the air supply to the release cylinder and opens an exhaust passage from the same to the atmosphere.

Upon moving the switch drum to position 3 the battery circuit through magnet f^3 is completed through the repeating switch *d* and the safety switch *h*; S and M are connected together and to the battery circuit; and at the same time the circuits through magnets f^5 and f^6 are kept closed, but the one through f^1 is opened. The completing of the circuit through magnet f^3 opens the air valve admitting air to the operating cylinder *a*. The operating piston immediately moves forward throwing the controller on one notch.

As soon as the operating piston reaches the end of its stroke the arm H strikes the shoulder I' and opens the repeating switch which breaks the battery circuit through the operating magnet f^3 cutting off the air from the operating cylinder and opening the air exhaust from the same to the atmosphere.

The operating piston is now returned to its original position by means of a spiral spring in the front end of the cylinder.

As the piston reaches the end of the return stroke the arm H strikes the shoulder J' closing the repeating switch, completing the battery circuit again through magnet f^3 and admitting air once more to the operating cylinder which now advances the controller to the second notch.

This cycle is automatically repeated until the controller reaches full series, at this point the fingers X and Y, which are connected to the terminals of the repeating switch are short circuited by the contact piece N', stopping further automatic action.

Upon moving the multiple control switch handle to position 4, the connection between the wire S and M is broken which opens the circuit between the finger Y and the repeating switch terminal Z, allowing the automatic notching of the controller to proceed.

When full multiple is reached the fingers X and G

are short circuited which again stops the automatic action.

To throw off the controller the multiple control switch handle is brought to position 1, this opens the circuit through magnets f^5 and f^3, thus shutting off the air from the operating cylinder and allowing air to pass into the release cylinder which acting through the rack and pinion throws off the controller.

Bringing the handle to the middle position opens the battery circuit through the circuit-breaker magnet f^6, thus shutting off the air supply to cylinder A. The spring in this cylinder being no longer compressed by the air pressure immediately opens the breaker.

It should be noted that a connection L′ is provided between the brake cylinder and the release cylinder, so that when the brakes are applied the controller is automatically thrown to the "off" position.

This connection also prevents the controller from being thrown on before the brakes are released.

It will be noted that two sets of batteries are used. This is done so that one set may be charged while the other is discharging. The batteries are charged by throwing one set at a time in series with the light circuit. This is accomplished by means of two double-pole double-throw switches so connected that they are thrown both up or both down to change from one set of batteries to the other.

Some of the special points of advantage claimed for this system are:

(1) The use of compressed air.

(2) The use of independent low voltage current for operating the control apparatus.

(3) Accessibility.

(4) All controllers are automatically turned off by the application of the air-brakes.

(5) Controllers and circuit breakers are opened if train breaks in two.

The system may also be adapted to the operation of cranes, elevators, etc.

Interurban Electric Railroads and Their Relation to Steam Railroads.*

So recent are the later developments in electric transportation facilities that the public has hardly yet realized the fact that the electric railroad is not still the light trolley line, with its stubby cars, following the outline of the landscape, with billowy motion and reaching in uncertain time an uncertain destination. In certain portions of the country, where a condensed population and heavy traffic have demanded better things, may be seen examples of the new type of modern electric interurban transportation, which has adopted the most effective methods of steam railroad service in addition to the peculiar advantages of the smokeless, noiseless and more easily controlled electric power.

These electric lines, moreover, whether of the later or earlier type, have undoubtedly educated the public to travel. With lower fares and more frequent service and the ability to stop at the customer's door, they are distinctly the "people's railroad," and have been so adopted. They have thus performed an important part in bringing about the prosperity which is observed on all sides. In accomplishing this it is not too much to say, although not generally admitted, that they have been of material benefit to the steam lines. It is true that with lower cost of working, and lower fares, they have taken from the steam railroads most of their suburban traffic, resulting in the withdrawal, in many cases, of suburban service by the steam lines. This, however, has not proven an unmixed evil. The usual suburban service by steam trains is ill-adapted nowadays to public convenience and with its frequent stops, wear and tear of equipment and damage claims, is not missed in the final sum of net revenues of the steam lines and its loss or curtailment, carrying with it the long list of commuters' woes, is not unfrequently a source of relief to the railroad manager.

On the other hand, the suburban and interurban roads have undoubtedly stimulated travel—they have not only created for themselves by reason of their frequent service, lower fares and more popular accommodations, a traffic not previously developed by steam service, but have in addition, originated for the steam roads important traffic on which they receive their long haul without the necessity of providing special accommodations, thereby creating the apparent paradox of a demonstrable amount of business lost, with an equally certain, if less demonstrable, amount of revenue gained. In view of this, some systems have already acquired auxiliary lines which they are developing in their own interest; others are seriously considering the substitution of electricity as the motive power for suburban and branch roads in order to realize the increment of profit arising from the new methods of transportation, while they are relying upon the increased activity among business interests, especially among the suburban and rural population, brought about by electric traction, to add materially to the volume of their traffic.

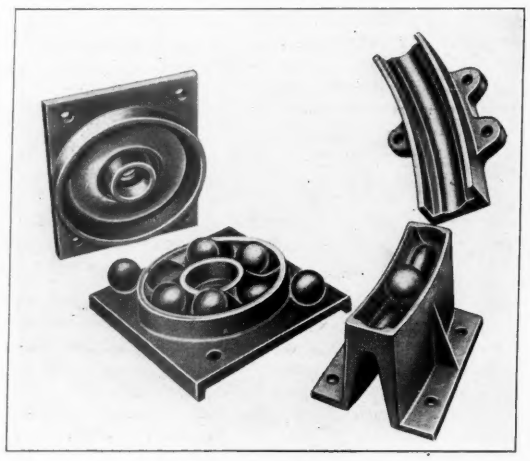
It is yet too soon to expect a complete understanding on the part of all railroad officers of the true relations of electric and steam transportation, and a similar lack of comprehension undoubtedly exists among the operators of electric lines. Time and the logic of events must be relied upon to work out this problem, as has been the case with others which have preceded it.

*By B. F. Wyly, Jr., Traffic Manager, Lackawanna & Wyoming Valley Railway Company.

In the meantime, the managements of the best types of electric roads have before them the work of so affiliating themselves with the steam lines as well as the public, as to produce the largest amount of lasting good to all concerned, a result which in the opinion of the writer, is the only permanent good to the electric roads and can only be secured by co-operative and friendly interchange of both traffic and ideas.

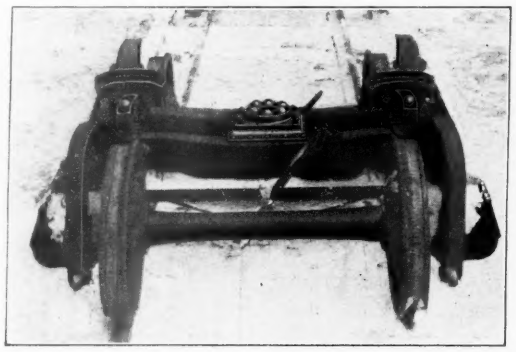
The Hartman Ball Bearing Center Plate and Side Bearings.

The committee appointed by the Master Car Builders' Association to investigate the subject of "Side Bearings and Center Plates" presented an elaborate report at the 1902 convention. This report was published almost in full in the *Railroad Gazette* June 20, 1902. Among the various devices tested by the committee was the Hartman "anti-friction" ball-bearing center plate, and their report states that this plate gave the lowest resistance of any tested. The report also gave the statements* of Mr. L. H. Turner, Superintendent of Motive Power of the Pittsburgh & Lake Erie, summarizing his experience with these devices, which were entirely favorable.



The Hartman Ball Bearing Center Plate and Side Bearing.

The most valuable feature in the center plate in question is the dish in the grooves in the bottom plate, which answers for two purposes, one being to keep the balls properly spaced and the other the tendency to straighten the truck quickly after leaving a curve. The side bearings consist of grooved guides of special construction, placed at each end of the truck bolsters, each containing one ball.



Hartman Ball Bearings Applied to Truck Bolster.

(Note wear on wheel tread.)

In common with any good "anti-friction" center plate and side bearings, the following advantages are claimed:

First.—Diminished wheel flange wear.

Secondly.—The rail wear on curves is greatly reduced because of the greater sensitiveness of the trucks.

Thirdly.—Increased trainload due to diminished train resistance.

With. *Without.*

Rail Wear With and Without Hartman Bearings.

The following report of Mr. G. E. Carson, General Foreman Car Department of the Pittsburgh & Lake Erie, is of interest: "Two years ago, following three years preliminary test of one set of Hartman ball bearing center and side plates, we applied 100 sets to cars with wheels of all stages of flange wear. Recent inspection shows all further flange wear arrested, and no wheels have been removed from any cause. Present indications are that all wheels will wear out on treads. Under ordinary conditions 25 per cent. of the same would have been condemned for sharp flanges."

*See *Railroad Gazette*, June 20, 1902, p. 471.

Other tests, on two trains, one equipped with the ball bearing plates and bearings and the other with ordinary devices, show that 11.4 per cent. greater speed was obtained in the first case with 5.5 per cent. less drawbar pull. The conditions of both tests were identical with the exception that the ball bearing tests were handicapped by a wet and slippery rail.

The Pittsburgh & Lake Erie has had 3,000 sets of this device in use for five years, and it is reported that no cars, so equipped, have had wheels removed on account of sharp flanges.

Chilled cast-steel balls are used. The experiments were conducted with plates bolted to the truck and body bolsters. However, since the favorable tests on the Pittsburgh & Lake Erie, arrangements have been made with the American Steel Foundries Company by which the top plate on body bolster and bottom plate on truck bolster are made solid with the bolsters. Under present conditions the device can be applied at a net cost of about $10.00 per car.

In drilling cars in the yards it is noticed that those equipped with ball-bearings roll around the curves with great freedom, and in the classifying yards much care on the part of trainmen is required to prevent mishaps.

This device is also being tried on the Lake Shore & Michigan Southern, and on the Bessemer & Lake Erie. It is understood that the St. Clair Terminal—a Pittsburgh local line, and the Chicago Short Line, are about to try this new style of construction.

A company under the title "Anti-Friction Bearing Co." has been incorporated in New Jersey. J. M. Schoonmaker, Vice-President and General Manager of the Pittsburg & Lake Erie, is president of the new company. The secretary and treasurer is B. C. Vaughn, assistant to the Vice-President of the Pittsburgh & Lake Erie. The capitalization is $500,000, but the present organization is reported to be temporary. The company's office is in Pittsburgh.

Street Railroad Improvements in New York City.

The special Engineering and Sanitation Committee employed by the Merchants' Association of New York to consider a number of propositions for the improvement of the street car service in New York City, has made a preliminary report, reprinted below, taking up in detail the propositions referred to it. The committee was composed of the following gentlemen: Cassius M. Wicker, Chairman; H. W. Brinckerhoff, Foster Crowell, C. H. Myers, Geo. A Soper, Ph. D., S. Whinery.

Proposition 1—Full and continuous service on all lines owned and controlled by the Interurban Street Railway Company, by the running of all cars necessary for the speedy movement and proper accommodation of the public, so far as physical conditions permit.

The practical carrying out of this proposition depends, as to extent and completeness, upon a number of contributory causes which are embraced in some of the other propositions which follow, and which will be treated of more in detail under their respective heads. Generally, however, as will appear in our remarks under other heads, we firmly believe, from the evidence before us, that the surface roads are not doing all they can to relieve the congested traffic on the important central North and South arteries of the city and the more important crosstown lines.

Proposition 2—Ample and frequent service on the lines east of Madison avenue and west of Broadway, and particularly the Sixth Avenue Line, in order that such increased efficiency on those lines may induce their use by the public, thereby relieving the heavy traffic on the congested main lines.

So far as the Second, Third, Seventh and Eighth avenues are involved, we are decidedly of the opinion that increased service on these avenues, tapping Broadway from the side streets at various points, will, if the service is continued persistently, extensively relieve much of the traffic that now seeks Broadway, Fourth avenue, Sixth avenue and Lexington avenue.

Proposition 3—The practicability of hereafter turning northbound Broadway cars into Sixth avenue at Thirty-fourth street, and northbound Sixth avenue cars into Broadway at Thirty-fourth street, thus abolishing the congestion at that point.

There would be no structural difficulty in making the proposed changes in the tracks. But the desirability of such a change depends upon considerations of a different nature, involving the convenience of the public in transferring, and the ultimate distribution of the traffic. In regard to both of these points, the committee have not had opportunity to make sufficient investigation. We do not regard such a change as at present necessary, for the reason that our observations indicate that the capacity of the Thirty-fourth street crossing is not nearly reached by the present traffic. The operating company has stated to us that as many as 975 cars have, under favorable conditions, been passed over this crossing by the three lines in one hour, and that 75 per cent. of this number is a reasonable estimate of a normal hourly capacity; whereas, at the rush hours, during the days of our observation, the total number of cars in any one hour did not exceed 492.

Proposition 4—The practicability of extending the Broadway route so as to avoid transfer at Fifty-ninth street and turn east and west along Fifty-ninth street.

The Committee fails to see any advantage in making such a change, for the reason that these cars are apparently needed for a special, supplementary service on Broadway, and the traffic coming from east and west can make use of more direct lines to downtown points.

Proposition 5—In view of the narrowness and crowded condition of Broadway between Seventeenth and Twenty-first streets, it should be considered whether the public convenience would not be promoted, dangerous congestion at Twenty-third street and Fourth avenue prevented, and the facilities for transportation increased, if the Lexington avenue cars were to run east from Broadway along Fourteenth street to the junction with the Madison avenue line, and thence up Fourth avenue to Twenty-third street, and along Twenty-third street to Lexington avenue.

We do not think this change desirable, for two reasons: First—In our judgment, the present congestion at Twenty-third street and Fourth avenue would be increased instead of

being diminished; and, second, we are of the opinion that any surplus room for additional cars on Fourth avenue should be utilized for the direct traffic of that line. We believe that the present congested condition on that part of Broadway may be greatly ameliorated by proper police regulation of the movement of vehicles.

Proposition 6—The extension of the crosstown Eighty-sixth street line beyond Eighth avenue, and the change of motive power to electricity.

The desirability of extending and improving this route has long been apparent, and we recommend that steps be taken to secure the repeal of the legislative act that now blocks the improvement. If further legislation is found to be necessary, strenuous effort should be made to secure it.

Proposition 7—The entire subject as to whether the efficiency and character of service on the downtown crosstown lines is such as the public has a right to expect.

It is apparent that the present conditions on most of the downtown crosstown lines are deplorable, and in no case are they satisfactory. The sanitary condition of the cars on these lines is abominable.

Proposition 8.—As at present operated, the surface lines in The Bronx and other suburban districts do not furnish adequate, or, in fact, any suitable accommodation for the protection of passengers at junction or transfer points.

Your Committee is of the opinion that at all points where the public is subjected to exposure, suitable shelter should be provided. An island of safety, with suitable roof, should be constructed at the end of Seventh avenue line, near Fifty-ninth street, and the Seventh avenue cars run farther north to that island of safety. A shelter should also be provided at Columbus Monument, and at many other points in Manhattan.

Proposition 9—The service of said roads in point of frequency of running cars in entirely inadequate to the public needs, and should be treated on the same principle as increased accommodation in Manhattan.

Your Committee has not had the opportunity to make sufficient observation in The Bronx, on this point, to enable us to answer the question involved in this proposition.

Proposition 10—The removal of unused car tracks in Greater New York, provided the city will safeguard the present franchise rights to the future use of those streets from which said tracks are removed.

We recommend that all unused tracks, except curves and connections necessary for use in emergencies, be removed from the city streets, such removal not to affect any franchise rights that now exist. Before any of these now unused tracks are removed, we would advise a more thorough examination of the location and especially the traffic possibilities of each, with a view to turning cars from Second, Third, Seventh, Eighth and Ninth avenues into the congested districts, over these tracks.

Proposition 11—The question of vestibuling cars.

In the view of your Committee the vestibuling of surface cars in New York City is not desirable.

Proposition 12—The question of two conductors on every trolley car during the rush hours, and on all the long cars at all times.

Whenever a street car, whatever its size, becomes so crowded that the conductor cannot collect fares without neglecting the stopping and starting of the car, it is necessary, in order to secure the safety of passengers, on the one hand, and to avoid delays, on the other, that some one shall temporarily take his place on the rear platform. It is the opinion of the Committee that such person should be a trained employee of the company.

Proposition 13—The question of the issuance of transfers at junction points, and the proper marking of all cars to show the route and destination of each car.

In regard to issuing transfers, the Committee is not yet in possession of sufficient accurate information to warrant an expression of opinion. It would not appear to be advantageous to throw additional travel on overcrowded lines for the mere purpose of extending the transfer privilege. In regard to the proper marking of cars to show both the route and the destination, the Committee is of the opinion that the color schemes now in use to designate some routes should be harmonized and extended, so that whenever the cars of different routes use the same track, each set of cars can be readily recognized and distinguished, the same color arrangement being employed both by night and day. These would be in addition to any other designation which may refer to the destination.

Proposition 14—The promotion of proper police regulations of trucking and traffic on the streets through which lines are operated.

The Committee regards this as one of the most important and far-reaching of all the propositions submitted. We believe that if carried out to the farthest extent practicable there would ensue a great improvement in the entire condition. A thorough study of the matter of regulation of traffic should be made by the city officials, in the light of the present situation. The following are recommended as applicable to Broadway, south of Fifty-ninth street: 1. No empty or idle vehicle of any kind shall remain standing on Broadway. 2. Heavy traffic to keep to the extreme right or curb; light traffic near the tracks. 3. Drivers to use tracks only when the balance of the street, to the right, is occupied. 4. A vehicle overtaking another shall pass to the left. 5. When a vehicle discharges passengers or freight and must remain in the neighborhood, it must move to the side street. 6. Vehicles occupying the track for any purpose must leave it at the first opportunity.

Proposition 15—The removal of obstructions of all kinds, including snow, from the public portions of streets on which car lines run.

We are of the opinion that the public ordinances covering obstacles in the street are not adapted to our present congested thoroughfares, and should be revised to meet the existing conditions. In view of the limited time at our disposal, we do not wish to consider that we have exhausted the subject in recommending: First—That the building laws be so amended as to prevent occupation of any portion of Broadway south of Fifty-ninth street with building material, and that the sidewalk abutting buildings under construction be roofed over and kept open for passage. Second—That in the removal of snow, important streets on which cars are run should receive first attention.

Proposition 16—The question of the enforcement of the public ordinances respecting ventilation and cleanliness.

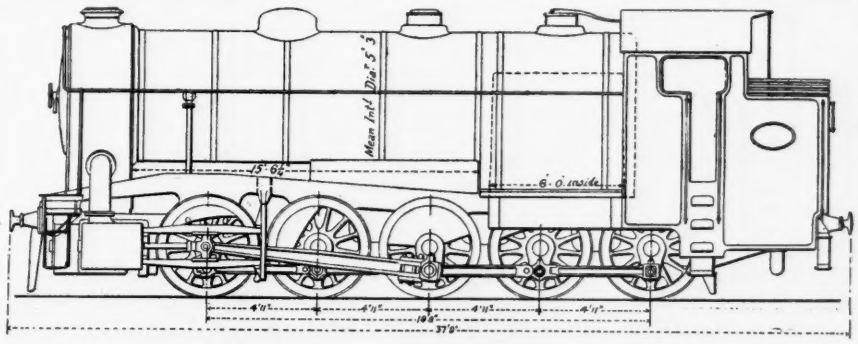
It is recommended that a strict observance of city ordinances relating to ventilation and cleanliness of cars be required. (1) The most important of these ordinances is that which relates to spitting on the floors of cars. It is desirable, in the judgment of the Committee, that the Board of Health cause the arrest and prosecution of those who violate this ordinance and that the Police Department and city magistrates co-operate with the Board of Health to this end. This should not be understood as absolving the companies from observing that part of the ordinance which requires that conductors call the attention of offenders to the warning notices of the Board of Health, which are posted in every car. It is recommended that the companies be called upon to issue imperative orders to conductors to observe that part of the ordinance which is binding upon them. (2) A satisfactory ventilation of the cars is impracticable so long as they are overcrowded, but a measure of relief can be secured by the adoption of improved methods of ventilation. (3) It is recommended that the use of cocoa, rope or other absorbent mats and permanently placed slats or gratings, on the floors of the cars, be discontinued. Removable grating of wood, metal or other material, which can be readily removed and cleaned, should be used. (4) The spaces behind and beneath the seats, which now serve as receptacles for refuse and dust, should, in common with the rest of the car, be thoroughly cleaned every day in accordance with Section 185 of the Sanitary Code. The cleaning of the cars is not done in a satisfactory manner. The cars should be cleaned more thoroughly and the work should be carried on in suitable places. (5) It is recommended that the Thirty-fourth street crosstown lines be equipped with such motive power as will enable these cars to be operated without detriment to the health of the passengers. The use of the present offensive and unhealthful storage batteries should be discontinued.

Proposition 17—The prevention of permitting passengers to stand between seats in open cars.

While your Committee recognizes that the standing of passengers between the seats of open cars not only occasions great discomfort, but leads to grave injury to health and morals, we are of the opinion that the practice can only be stopped by prohibitory laws, rigidly enforced, and we believe that the enforcement of such laws would be very difficult until such time as the transportation facilities of the city are greatly increased.

Ten-Coupled Suburban Tank Engine for the Great Eastern.

We have from time to time published various notes concerning the new 10-coupled suburban tank engine being built at the Stratford shops of the Great Eastern from the designs of Mr. James Holden, Locomotive Superintendent. We are now informed that this interesting engine has been completed.



Suburban Tank Engine for the Great Eastern.
(Designed by Mr. James Holden, Locomotive Superintendent.)

It is said that a speed of 30 miles an hour is to be attained within 30 seconds after starting, and the designs have been worked out with this in view. The total weight in working order, including 7,000 gal. of water and 3½ tons of coal, is 134,000 lbs. Each of the 10 coupled driving wheels are 54 in. in diameter. The cylinders are each 18½ x 24 in., two being on the outside of the frames and one between the frames.

The boiler barrel is 15 ft. 6 in. long and 63 in. in diameter. The center line is 9 ft. above the rails. The grate area is 42 sq. ft. and the fire-box extends over the rear wheels. The boiler contains 395 1¾ in. tubes which together with the fire-box gives a total heating surface of 3,010 sq. ft.

We are indebted to *Transport* for the above illustration.

Production of Pig Iron—1902.

The Bulletin of the American Iron & Steel Association has received from the manufacturers complete statistics of the production of all kinds of pig iron in the United States in 1902. The total production of pig iron in 1902 was 17,821,307 gross tons, against 15,878,354 tons in 1901 and 13,789,242 tons in 1900. The increase in production in the second half of 1902 over the first half of the year was 204,159 tons. The total increase in 1902 over 1901 was 1,942,953 tons. *The Bulletin* says:

"It is remarkable that there should have been such a large increase in production in 1902, when there were serious adverse conditions to contend with, chiefly inadequate transportation facilities, resulting in a short supply of coke and iron ore and the banking for longer or shorter periods of many furnaces. The anthracite coal strike also seriously interfered with the activity of many eastern furnaces."

The production of Bessemer and low-phosphorus pig iron in 1902 was 10,393,168 tons, against 9,596,793 tons in 1901. Of basic pig iron, 2,038,590 tons were made, against 1,448,850 tons in 1901. The output of charcoal pig iron was 378,504 tons, against 360,147 tons in 1901. The production of mixed charcoal and coke pig iron was 11,665 tons, against 23,294 tons in 1901. Of spiegeleisen and ferro-manganese there were made 212,981 tons, against 291,461 tons in 1901.

In 1901 this country made more pig iron than Great Britain and Germany combined, and in 1902 the United States made more than these two countries and Belgium combined. The whole number of furnaces in blast on Dec. 31, 1902, was 307, against 266 on Dec. 31, 1901, and 232 on Dec. 31, 1900. Of the 17,821,307 tons of pig iron made in 1902 the five largest producing States were: Pennsylvania, 8,117,800 tons; Ohio, 3,631,388; Illinois, 1,730,220; Alabama, 1,472,211; Virginia, 537,216.

Concerning Too Much Freight Traffic.

In the latest circular of Hambleton & Co., of Baltimore, we find the following expression of the business men's view of some aspects of the present congestion of freight traffic:

The action of the trunk-line railroads in refusing to accept consignments of grain from the west to the seaboard and the generally congested condition of railroad traffic leads to the conclusion that we have outgrown our railroad facilities. Unquestionably one effect of the combination of railroad interests is to discourage competition. This policy is one of advantage to existing roads but the question is, is it not a disadvantage to the business community?

We have a condition here at Baltimore, for instance, which is almost insufferable. Our grain merchants have made very large sales for shipment to Europe. They have purchased the grain at the West, have chartered vessels to carry the same under the natural expectation that in due course the grain would come forward. But this expectation has not been realized. On the contrary many carloads of grain have been on the road for weeks, if not months, held up and side-tracked somewhere and now the railroads give notice that they will not accept grain for transportation to the seaboard.

This delay and refusal to haul grain is causing our shippers not only great inconvenience but positive loss. Ships chartered to carry wheat and corn, especially corn, have been lying here for weeks and demurrage charges, interest, etc., have more than eaten up all profits. Now how are we to account for such an extraordinary state of affairs? Is it because the railroads have not sufficient equipment to handle the traffic offering, or have we outgrown our railroad facilities? If the Baltimore & Ohio can be taken as an illustration, a lack of railroad equipment can scarcely account for the situation. The B. & O. in the past six or seven years rather has spent tens of millions of dollars on new equipment, and has purchased thousands of cars and hundreds of locomotives. It really looks as if it is the railroads themselves which are unable to handle the traffic rather than a lack of equipment. There are thousands of cars out somewhere on the road, loaded with grain and destined to Baltimore. It is not owing to lack of equipment that these cars are side-tracked but to the inability of the railroads to handle them. This would look like a shortage of motive power; but trains are moving all the time, yards are blocked and the railroads are simply overwhelmed. Does this not look as if there is more traffic than the present trunk-lines can handle? And yet we observe a united opposition to any other railroad which is seeking to reach tidewater.

The explanations of railroad managements are not satisfactory—they do not explain the situation.

The Wabash system is exerting every effort to reach the Atlantic Seaboard. The roads already occupying the Atlantic seaboard ports are using every means to keep the Wabash out. In the meantime the port of Baltimore (indeed all eastern ports) is suffering for transportation facilities. We are still of the opinion that the Wabash (West Virginia Central & Pittsburg—Western Maryland combination) is merely a side issue. Wabash will either reach New York or secure terminal facilities at Norfolk or in that vicinity.

Mr. Robert Bell, M. P., General Secretary of the Amalgamated Society of Railway Servants, says that the damages and costs which the Society will have to pay as a result of the decision against it in the Taff Vale strike controversy of 1900 will amount to about $200,000. It is announced that the Society has decided not to appeal to the higher court. Mr. Bell, addressing a meeting of his constituents, told in considerable detail how he had tried to restrain Mr. Holmes. Mr. Holmes is the subordinate or district leader who, we believe, was the officer in immediate charge when the strike was begun. Mr. Bell was found by the jury guilty of conspiracy.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The anti-trust bill which is said to have been agreed upon by the sub-committee of the House committee, at Washington, and which, it is predicted, will be passed by Congress this week or next, requires corporations engaged in interstate commerce (not railroads alone) to file annual reports with the Interstate Commerce Commission, and the Commission is required to prepare reports for distribution. As this and the several other propositions before Congress for regulating interstate commerce appear to be as yet in somewhat indefinite form, we refrain from considering them at length; but railroad men will be more particularly interested in the fact that Senator Elkins, whose name is attached to the Interstate Commerce bill, which has been most prominently before the public for the past year, has introduced a new bill. This bill abolishes the imprisonment feature of the Interstate Commerce law and makes the shipper as guilty as the railroad in case of illegal rate getting; but it omits the other features of Mr. Elkins' former bill. The new bill imposes a fine of not more than $20,000 on any person or corporation who offers, gives, accepts or receives a rebate; and it has a section empowering the Interstate Commerce Commission to take freight discriminations to the Circuit Court whenever it has reasonable ground for belief that unlawful rates are being given. The significance of this bill would seem to lie in the indication, which it gives, that the differences of opinion which have thus far prevented action by Congress on the Senator's more comprehensive measure are incurable. This would seem to be a judicious move. If the former bill is adhered to, there is nothing in sight but an interminable deadlock, for the opponents of the measure are as persistent as its friends. To the abolition of the imprisonment clause there has been no opposition; and to punish the shippers who accept unlawful rates will only be doing what ought to have been done long ago. This authority for punishing shippers is already provided in Section 10 of the present Act, but there is no objection to re-enacting the clause if enforcement of the law can thereby be made easier. If, now, Congress will pass this bill and will give the Commission $500,000 with which to detect violations of law, as is proposed in connection with one of the Anti-trust bills, Mr. Prouty can meet Mr. Hines on his own ground, and the Commission will have the opportunity to show the people what there is in the present law that is beneficent and useful.

The rear collision of passenger trains which killed twenty or more passengers at Cranford, N. J., last Tuesday evening, is distressing enough in itself; but to railroad men it comes with particular significance because it is the fourth of a series of such collisions within a few months, all occurring on lines worked by the block system: Menlo Park, N. J., in October; Quaker Valley, Pa., in December; Ada, O., in January, and now Cranford. At Ada the block signaling was non-automatic, but at the other three places the signaling equipment (automatic) was complete, distant signals being provided, and there being no question about the proper location and visibility of the signals. The discussion of the causes of this last collision by the public authorities, so far as there is any discussion, and also, perhaps, that by the railroad officers, will probably deal, as in similar cases before, with the usual questions about the difficulty of seeing signals (the engine of the Philadelphia express was leaking a good deal of steam), the lack of strength in the wrecked cars, the reason why the train was not traveling on its regular track, the promptness or lack of promptness, in getting fire engines, and other well-known details. But it is important to bear in mind that these are secondary matters. All of them are important, but they should not be allowed to obscure the main question. Not even the question of brake power—a deficiency in which may at any time be the second of two causes, almost equally important, of a disastrous collision—should blind any one to the fact that the observance of the signals is the main issue. The engineman in the Cranford case is reported fatally injured. If he dies, that settles *some* of the questions that otherwise would weigh on the superintendent's mind. But his death does not preclude inquiry as to his character, temperament and training. Is it a fact that enginemen on very fast trains take risks where with an ordinary train more caution would be observed? This is not a trivial question; repeated collisions have made it a serious one. What about the rule requiring firemen to observe fixed signals and shout them to the engineman? It ought to be declared a good rule and adopted, or an impractical or useless one, and definitely thrown aside. If the fireman is not to aid in the lookout, an added importance attaches to the engineman's function. If the fireman is to aid when it is convenient to do so (that is, partially), the trainmaster has a duty to see that, relying on two stools, he does not fall to the ground. The question of flagging also comes in for investigation. Do enginemen deliberately maintain speed past cautionary signals, depending on the flagman to prevent disastrous results from such recklessness? The collision records indicate that it would be a good use of money to spend thousands of dollars to test this point. All these questions are crying for attention. We are increasing the use of the block system to cure the evils of the time interval and flag; but our English cousins will begin to wonder whether we have men competent to operate any system. And Englishmen will not be the only persons who can ask unpleasant questions; the men who advocate the use of automatic apparatus to apply brakes and shut off steam will find increasing favor with legislatures and the public.

Concerning the Rail Situation.

The special report made by Mr. Dudley to Mr. Wilgus, which is printed on another page, gives an opportunity to say a word about the rail situation. It will be remembered that the American Society of Civil Engineers has a special committee (appointed a few months ago) to consider the whole subject of the rail sections, of mill practice and of specification and inspection. Quite lately a committee of representatives of the mills has been formed to work with the committee of the American Society of Civil Engineers. Last week these two committees met in New York, separately, at first, and then in joint session. It would not be appropriate or desirable to report in detail the discussions at those sessions, even if we knew them. They were quite informal. The main object, as we understand, was to clear the ground and to prepare for common action.

It may not be amiss to state again the main facts of the situation.

First: Probably everybody who has paid any attention to the metallurgy of steel in recent years, and particularly to making rails, is by this time thoroughly aware of the fact that the structure of steel depends much upon the finishing temperature; and in consequence of the spread of this knowledge there has come about a definite and general notion that the final passes on rails must be made at a lower temperature than is now common. Nobody disputes this position.

Second: It is pretty generally conceded that the railroads are disappointed in the results which they have got from the recent heavy sections. They do not get service enough to compensate for the money paid for the additional weight. This is matter of general knowledge. A chief engineer has lately said to us "The combination among the rail makers is resulting in a constant deterioration in the quality of the material we are receiving and we ought to do all we can to counteract this tendency." We do not accept or reject this opinion; we merely give it as a specimen of what we often hear.

Third: It has been thought by a good many people that a still better balance of the standard sections would help to secure a lower finishing temperature and, consequently, a better internal structure. This means a transfer of a part of the metal put in the head of the American Society standard sections to the flange, and this idea probably had more to do than any other one consideration in bringing about the appointment of the American Society's committee; although it is only one of the considerations which led to the formation of that committee.

Fourth: It has been maintained and is maintained by many that a shrinkage clause in rail specifications would help to secure a lower finishing temperature. That is, it is obvious that if, for example, saws for a 30-ft. rail are set 30 ft. 7 in. apart the rail can be delivered to the saws hotter than if the saws are set 30 ft. 5⅞ in. apart. There are makers who do not believe that a shrinkage specification will control the structure of the steel even if it does control the finishing temperature.

Fifth: Various methods of mill treatment are now used to secure the results which everybody knows can be secured by thorough working at low temperature. The Kennedy-Morrison process, as used at the Edgar Thomson mills, is one of these. That process delays the rails before they reach the finishing rolls, and must be familiar to our readers. The method which is practiced at Sparrows Point is described in Mr. Dudley's report printed in this issue.

This is a short statement of the situation. The American Society's committee, so far as we are informed, would not now recommend any change of section. What it may be led to do by further information of course we shall not try to conjecture. The committee would not with its present information try to lay down specifications of chemical composition or mill treatment. The attitude of the committee, so far as we can judge, is to let the makers agree as to what is necessary in order that they may give the results sought, namely, a better and more constant quality of finished steel. If the rail makers agree that it will be for the interest of the art to make some modification in the American Society's standard sections, we suppose the committee will recommend such modification. The representatives of the rail makers, so far as we are informed, do not think that any change of section is necessary, but on this they are not agreed, and this appears to be only a tentative opinion.

As the matter now stands, the American Society's committee will probably state with some definiteness its questions and requirements and the rail makers' committee will take these up and answer them as from the whole body of manufacturers. This, we believe, is a fair statement of the present situation, and this situation seems very promising. The attitude of the engineers is conservative and reasonable, and the attitude of the rail makers is reasonable and liberal, and it is pretty certain that good and lasting results will be worked out by the two committees. Obviously, a matter so intricate, involving so many disputed technical points, to say nothing of business interests, cannot be settled at once out of hand.

Highway Grade Crossings in New York State.

In the State of New York there are approximately 8,143 miles of railroad, with 10,037 highway crossings, of which 8,599 are at grade. Prior to May 22, 1897, the only crossings eliminated were those changed voluntarily by the railroad companies, or through mutual arrangements with the towns and municipalities. The matter of grade crossings received no attention in the annual reports of the Railroad Commission previous to 1897, except in regard to applications made by one company to cross at grade the tracks of another. In these cases, the Commission prescribed interlocking devices, etc., and had power to give or to withhold permission to make the crossing.

On the above date, however, the present grade crossing law went into effect. It is presented, without comment by the Commissioners, in their 1896 report, and provides for an annual appropriation by the legislature, out of any moneys not otherwise appropriated, of $100,000, to pay the State's share of the expense of removing existing highway crossings from grade. If less than this is spent during any year, the balance becomes part of the appropriation for the ensuing year, and does not serve to increase it. No deduction, however, must be made for unadjusted outstanding liabilities.

If the appropriation for any year is insufficient to pay the State's proportion of any change ordered,

this must be cleared up in the ensuing year before any new work is undertaken, unless additional appropriation for it is ordered by the legislature, and it is further provided that the work ordered done must be apportioned among the different railroads and municipalities of the State, so as to produce equality of burden, as far as the nature of the case will permit.

The division of expense between the railroad, the municipality, and the State, may be tabulated as follows: New railroad crossing existing highway; expense of removing crossing to be borne entirely by the railroad; new highway built across existing railroad, one-half the expense to be borne by the railroad and one-half by the municipality; existing crossings, half the expense to be borne by the railroad, and the balance divided equally between the municipality and the State.

In other words, the maximum expenditure which can be made during a single year, with State aid, is $400,000, of which half is contributed by the railroads. But as a matter of fact the appropriations from 1898 to 1901, inclusive, aggregated only $367,500, or a trifle over $90,000 per annum, and in 1902 no appropriation whatever was made. As a consequence of this disinclination on the part of the State to carry the work forward, very little has been done, considering the need. Since the Act became a law, about 65 of the 8,599 crossings have been eliminated, so that, at the present rate, about 132 years will be required to complete the work.

No further argument than this would seem to be necessary. The traffic on the railroads throughout New York State, many of which are the main arteries for traffic from the West, is fast growing in volume, and the delays to the public and the menace to human life and limb are correspondingly increased. Long freight trains and fast passenger trains are becoming an increasing restriction to highway travel, and hamper the development of property adjacent to the railroads, besides causing many accidents.

A comparison with conditions in Massachusetts shows how unprogressive New York is in these matters. During the year ending June 30, 1902, 184 persons were killed and injured at grade crossings in New York State; equal to 25 per 1,000,000 inhabitants. In Massachusetts, during the same year, 37 persons were similarly killed or injured, which is at the rate of 12 per 1,000,000 inhabitants; less than half the percentage for New York State. This result in Massachusetts has been brought about by liberal expenditures under the State law, which provides that $500,000 may be appropriated annually, and that the unused balance shall be added to, instead of deducted from, the appropriation for the succeeding year. In 1890 $5,500,000 was voted, to be spent at the annual rate named above, and in 1902, $5,000,000 more was added, under the same conditions. The terms of the division differ slightly from those in New York, 65 per cent. being the share which falls to the railroad company; not more than ten per cent. to the city or town, and about 25 per cent. to the State. Action may be originated upon petition of the mayor and aldermen of a city or the selectmen of a town; by the directors of a railroad company, and in other ways, decision in the matter being vested with the Railroad Commission.

In a word, Massachusetts, with a population about one-third as great as New York, has, up to the present time, appropriated nearly thirty times as much money for the elimination of grade crossings, and, as a result, shows a ratio of accidents to persons which is less than one-half as great, with a prospect of greatly reducing the figure in the near future. A further result of this liberality has been the increase in the value of property adjacent to the railroad, with correspondingly greater assessment for taxation.

The New York report for 1901 showed work in progress on 12 projects. The commissioners, in their report for 1900, say it is believed by some that the appropriation should be increased, but express no opinion in the matter. A list of the various pieces of work outstanding at that time showed that 21 changes had been ordered under the Act, one of which was completed and three others were in progress. Plans or contracts had been approved for nine; one order had been appealed, and nothing had been done with the remainder. Certain other small crossings had been closed, and in some cases highways had been diverted to other crossings overhead or at grade, but actual construction work was limited to the four crossings mentioned. The above record is in no way an extreme case, but shows quite accurately the state of progress at the present time, in spite of the fact that many of the larger cities and towns, besides the railroads themselves, are exceedingly anxious to eliminate crossings and pay their fair share of the cost, but are powerless to secure the proportionate aid from the State appropriation.

The universal freight blockade still continues, and about the only thing to be said concerning it is that it appears to be affecting a larger territory as time goes on. A railroad officer in New York says that the car shortage is greater than the traffic men had ever thought possible in their wildest conceptions of impending prosperity. On Sunday last the Pennsylvania road had planned to again put forth all its energies and move the accumulations of eastbound freight on its lines; but a snowstorm thwarted the arrangement and left the situation as bad on Monday as it was on Saturday; this notwithstanding the fact that 8,500 cars were moved past Lewistown Junction on Saturday and Sunday. A Chicago despatch of Monday says: "Instead of improving their traffic conditions, eastbound roads have grown worse and fallen further behind in their orders, and have refused a large amount of new business. They might have had 25 to 50 per cent. more grain the past week had they been able to handle it, but they notified the trade in most instances that they could not receive new business and had few cars to furnish. Every road, with the exception of the Lake Shore, has practically given notice to this effect. The Michigan Central and Wabash have turned down a large amount of grain owing to the difficulty in crossing the Detroit River, which has been filled with ice. The Grand Trunk is blocked, and the Pennsylvania appears to be in the worst condition of any road. It is so bad, in fact, that its Western connections decline to transfer grain to it. This works a hardship on the grain handlers, but it is a physical impossibility for the road to handle its enormous and unprecedented traffic. A premium of $10 a car has been offered by grain shippers who have Eastern contracts to fill. Coal is coming westward in moderate volume, and the merchandise and lumber traffic is heavier than usual." At Philadelphia and Baltimore grain merchants presented a strong protest against the action of the railroads in refusing to receive eastbound grain and flour. At Pittsburgh it was said that the price of hay and grain had advanced considerably in consequence of the scarcity due to the embargo laid by the railroads. All of the embargoes are due, in part, no doubt, to the fact that borrowed cars are now paid for by the day; and some one may be expected soon to come forward with a proposition to abandon the per diem rule; to declare it the cause of all our woes. But the true method will be, rather, to thank the new rule for the good that it has done; for forcing the adoption of a rational way of dealing with a congestion of freight. Trunk line territory is not the only part of the country affected. At Nashville the Louisville & Nashville has refused to receive freight for certain points on the Southern Railway in Alabama, because the latter is unable to receive what is offered. At Macon, Ga., business men are complaining of a lack of cars; even in New Hampshire it was reported that cattle and horses were in danger of starvation because of delays of grain due from the West. At Pittsburgh last Saturday it was reported that 2,000 mill employees were idle as a result of the shortage of coal and the general congestion of freight. The Chicago, Burlington & Quincy has issued a general notice forbidding agents to load Burlington cars to points off the company's lines.

Traffic men have long recognized that to find railroad regulation in its perfect flower the place to look is in Texas. In that State we have our most fatherly and perhaps most friendly State commission, and the way in which these august government authorities take hold of the multitudinous details of the traffic department is a constant incitement to admiration. The latest manifestation in this line is a notice prescribing the estimated weights on certain fruits and vegetables. In this notice we are informed that mustard and green onions, carried in flour barrels, will hereafter be charged at 60 lbs. a barrel: the same in sugar barrels will weigh 70 lbs.; or, if they do not, they ought to. Cantaloupes and pears, in Climax baskets, are to be estimated at 15 lbs., and cauliflower in crates 12 in. x 18 in. x 24 in. will be entered at 50 lbs. Cucumbers, squash, plums and a lot of other things receive equally friendly treatment. The only cause for regret in this matter is the thought that the advantages of this benign exercise of sovereignty are limited to Texas. If only the Interstate Commerce Commission had the power to give a truly national character to this important branch of political science!

A contemporary, in a recent issue, states that a de Glehn four-cylinder compound of the Northern of France hauled 220 net tons 120 miles in 121 minutes, or at an average speed of *64.4* miles per hour. It is further stated that another engine of this same type has succeeded in hauling 370 tons 184 miles in 190 minutes with a coal consumption of *only* 38½ lbs. per hour. The first statement is, of course, purely a matter of arithmetic, but the second statement is more far reaching in its importance. At that rate, if we assume that the cycle is perfectly reversible, this remarkable machine is capable of distributing something like one ton of coal along the right of way each hour. Further comment is unnecessary, but we desire to call the attention of the so-called coal trust to a possible future competitor.

NEW PUBLICATIONS.

A Text Book of Field Astronomy for Engineers. By George C. Comstock, Director Washburn Observatory and Professor of Astronomy in the University of Wisconsin. New York: John Wiley & Sons, 1902. Price $2.50.

A good book on this subject has been much needed, and Professor Comstock's work, for a number of reasons, is more satisfactory than any of its predecessors.

This result is largely due to the author's having formed at the beginning a correct notion of what a civil engineer's astronomical course should be. The author disentangles himself completely from ancient trammels by asserting boldly that the first object of an astronomical course for engineers is "training in the art of numerical computation." If there are degrees in the truthfulness of truths, to this belongs one of the high degrees. Engineering students frequently attach too little weight to their astronomy because they expect to engage in bridge-building, railroad work, or what not, and do not believe they will need astronomy. But the skill in computation derived from astronomy, and astronomy alone, is of inestimable value in any and every branch of the engineering profession.

This fundamental principle once recognized, the author has carried it out with skill and good sense. There is neither too much nor too little. The book is not enough for the self-taught genius, and something is left to the professor; but that something does not (as usual) mean every little essential detail of the subject.

Among special excellences is the notation. Often spurious originality of formulæ is sought by merely changing the lettering. Not so here: wherever possible Chauvenet's notation is followed and credited; and an excellent table of symbols is printed in the beginning of the book. But there is no lack of originality: the articles on accuracy of logarithmic computation and latitude by circum-meridian altitudes are good examples. Throughout, the English is lucid and forcible; we notice no slip except perhaps the use of "label" on pp. 5, 13, etc. And if we must suggest a slight adverse criticism of so good a book, it is the absence of tables. A very few pages of these would have made it unnecessary for the student to buy any tabular books except ordinary logarithms. But the author probably believes in the professional student accumulating a professional library; it is only fathers paying expenses of education who may object to this.

TRADE CATALOGUES.

The Forest City Paint & Varnish Co., Cleveland, Ohio, have issued a catalogue of the large line of paints, varnishes and supplies which they handle. The index shows 90 items in the line carried, including everything known to the trade in the way of paints, oils, varnishes, lacquers, fillers, stains, etc.

Phosphor Bronze.—The 1903 price list No. 21 of the Phosphor-Bronze Smelting Company, Philadelphia, has been sent us. It is conveniently arranged, has an index and is pocket size. The list includes tables of sizes, weights, etc.

The Rushmore Dynamo Works, Jersey City, N. J., have issued an attractive 15 page catalogue, illustrating and describing their aplanatic lens-mirror headlight. Descriptions of this light appeared in the *Railroad Gazette* Aug. 15 and Dec. 26, 1902.

The H. W. Johns-Manville Company, New York, have sent us the advance sheets of a small booklet describing a new fire-proofing material which they have named "Salamanderite." It is claimed that the new material is absolutely fire-proof, water proof and sanitary, and that it can be successfully used for decorative purposes.

The Inland Equipment Co., St. Louis, Mo., has sent out a pamphlet describing the link metallic car roof, which it makes. The book contains seven half-tone plates showing the various details of the application of this roof of which there are two kinds, known as "inside" and "outside." Both are made of formed metal sheets, and are of a form readily applicable to the car. The "inside" roof has an outer roof of wood so that the under metal roof is not visible from the outside. The "outside" roof gives a complete metallic covering to the car, affording a water-tight, though entirely flexible roof. A list of users of this roof includes some of the largest roads in the country.

The October Bulletin of the *Steel Cable Engineering Company*, Boston, Mass., illustrates a number of special types of conveying and other machinery. The pan and bucket conveyor with steel center and steel cable construction shown on p. 13 is of particular interest. It is claimed that this design is very durable, especially where substances of an abrasive character are to be handled. The catalogue contains 38 pages and the designs and arrangements shown therein will be found of much value by engineers interested in conveying machinery.

The Pratt & Whitney Company, Hartford, Conn., have sent us an illustrated catalogue of their new model turret lathes. The descriptive matter is very complete and the illustrations are artistic. The new machines are not only

adapted to repetition work in large lots but their use is also economical where small lots of not more than six are to be made. The catalogue contains 37 pages and the dimensions correspond to those of previous catalogues —a valuable feature in filing.

The American Blower Company, Detroit, Mich., have issued a small 11 page pamphlet describing the "A. B. C." moist air system of lumber drying. Several testimonials are included.

The Stability of Track.

Mr. P. H. Dudley is Reporter for America to the International Railway Congress, seventh session, to meet at Washington, in May, 1905. He reports on the topic of "Rails for Lines With Fast Trains." In seeking information he has distributed a statement of the principles entering into the matter of stability of track, which principles he has been able to deduce from his study of the autographic records made by the stremmatograph. It will be remembered that this is a device employed by him for accurately recording the stresses in track under moving load. In time past we have been permitted to publish some of these records.

The tabulated stresses of the autographic records of the stremmatograph are voluminous. A study of the stresses in the base of rails under moving locomotives, cars, and trains, on stiff rails, shows many general principles and facts. It is intended in this paper to refer only to the principles which are illustrative particularly of the early American theory and practice. These principles were applied in the inception of our railroads, and are still the basis of our unexcelled practice. They were understood qualitatively, and the railroads constructed in accordance therewith, but were not pointed out specifically, owing to the fact of the inability of making quantitative determinations of the forces transmitted to the rails and roadbed, by the moving locomotive and cars. The art and science were distinctly in advance of the ability to make the necessary physical measurements of the strains in the rails.

The stremmatograph investigations have been made, practically, upon track in excellent condition, of stiff 80-lb. and 100-lb. rails, joined by three-tie supported joints, which were able to transmit the wave from one rail to the other, with little loss or shock.

In stating these principles, while they are generally true as applied to railroads, it must not be expected that as high efficiency could be obtained on tracks of light rails and not well maintained. This does not affect the principles, only the degree of efficiency attained.

PRINCIPLES.

Basal Principle.—For the instant of the passage of a train, the locomotive, rolling stock, and the permanent way, acting conjointly, are required to complete and form a single means of transport; the greatest combined stability, efficiency and capacity being secured by adapting their construction one to the other, for harmonious action, instead of the generation of destructive dynamic forces.

Second Principle.—Under moving locomotives and cars on rails capable of performing the functions of continuous girders, on flexible supports, two types of undulations occur—"General" and "Specific."

The "General" type consists of a wave preceding the front truck wheel, then a general depression of the rails, cross-ties, ballast and sub-grade under the entire wheel base of the locomotive or car trucks. For loaded freight or mineral cars of 60, 80 or 100 thousand pounds capacity, with a wheel spacing of not over 18 or 20 ft. between the inside truck wheels, on rails, the section having a moment of inertia of or over 28.5 fourth power inches, the general depression extends from the pilot wheel to the rear wheel of the train.

The "Specific" type consists of a deflection of the rails, cross-ties, ballast and subgrade under each wheel contact in the general depression, producing contrary flexures in the rails between the wheels and either side of the wheels, as a rule, in distributing the wheel loads to the roadbed.

Third or Jervis Principle.—The independent frame and forward truck wheels of the moving locomotive subdivide the total load and utilize a portion to take up the looseness of the superstructure under stiff rails. The driving wheels run on a restrained beam, one end of which is under the forward truck wheels, and the other end under the tender wheels. This efficient method consolidates the track, then the loads on the truck and tender wheels assist to carry and distribute the heavier driving wheel loads to a portion of the track, nearly or as long as the length of the wheel base of the locomotive, when drawing its train.

This causes the engine to ride steadier, the minute undulations of the truck and the wheels enabling not only the center of gravity of the locomotive, but all portions, to ride over the rails with less vertical and lateral movements than is possible without the flexible truck and wheels.

Fourth Principle.—The general law of the distribution of stresses under moving locomotives is, that the total amount of strains and their consequent unit fiber stresses set up in the metal of rails to limit and balance the individual strains of each passing wheel load, plus the effects of the expended tractive effort, will be practically the same amount as though distributed from the center of gravity of the locomotive.

This refers to a given location in rails sufficiently stiff to perform the functions of continuous girders for the wheel loads and wheel spacing, before dynamic forces are generated. This general law is in accordance with the principle of Mechanics, that the sum of the effects of the loads of the several wheel bases of the locomotive, plus the effects of the expended tractive effort, is equal to the effects of the total load of all the wheels, plus the effects of the expended tractive effort.

Owing to the constant changing of the equalizing of the total load of the locomotive per axle when running, the effects per wheel vary per revolution, and the total effect is used for closely comparing the stresses of two or more locomotives.

It is, however, a distributed, and not in any sense a concentrated, load. The centers of gravity of the engine and the tender are distinct as structures, but they are combined in the effects produced on the permanent way in the distribution of the entire load of the locomotive, and expended tractive effort.

Fifth Principle.—The expended tractive effort of the moving locomotive is one of the factors in producing stresses in rails. But in rails stiff enough to perform the functions of continuous girders for the wheel loads and spacing, the stresses are distributed to a longer portion of the rail than that under the wheel base of the driving wheels.

Sixth Principle.—In stiff rails it is the generated forces of the moving wheel loads which cause the stresses of either compression or tension in the metal to distribute their effects to the cross-ties, ballast and subgrade. Therefore, it is their sum and not their difference which represents the work performed.

Seventh Principle.—The combined stability, efficiency and capacity between the locomotive, rolling stock and the permanent way, increases in a faster ratio than the direct stiffness between two sections of rails.

These principles are far reaching and of great interest and importance, elucidating some used in the construction of the motive power and rolling stock, most of which were utilized as soon as the strictly experimental stages of development of the early railroads were passed.

FACTS.

First.—The stresses of the specific deflections under the different wheels of the wheel base of a moving locomotive or car are not in accordance as a rule with the supposed static loading.

Second.—The cross-tie spacing does not definitely control the spans of the bending rail under the moving wheel loads.

Third.—The realized coefficient of adhesion of the system of the driving wheel base of locomotives has been increasing in recent decades of railroad experience.

The Ruthenberg Process at Lockport.

On Jan. 15 a party of iron manufacturers visited the plant of the Cowles Electric Smelting & Aluminum Works at Lockport, N. Y., where there is installed what is erroneously called an electrical furnace. The apparatus is the invention of Marcus Ruthenberg, of Philadelphia, and really is capable of performing two functions, that of agglomerating or fritting fine ores, concentrates or flue dust so as to put them into much better condition for charging into the blast furnace, or that of reducing the iron oxide to what may be termed a sponge, to be employed as a raw material in the open hearth furnace. The apparatus consists of a horizontal horseshoe magnet hinged so that its poles may be approached. The poles are surrounded by water cooled bronze rolls covered with carbon plates, which rotate in opposite directions. Along the line of closest approach an electric arc is formed which subjects the material to be operated upon to a high temperature. The material is fed upon one of the rolls and is thus carried to the active zone, dropping out of the reach of its influence as the revolution of the roll carries the material beyond it.

The test of the apparatus was witnessed by John Fritz, of Bethlehem, Pa.; S. T. Wellman, of the Wellman-Seaver-Morgan Engineering Company, Cleveland, Ohio; W. J. Taylor, of the Taylor Iron & Steel Company, High Bridge, N. J.; Edwin Thomas, of Catasauqua, Pa.; J. K. McLanahan, of Hollidaysburgh, Pa.; Frank Slocum, of the Jones & Laughlin Steel Company, Pittsburgh, Pa., and J. B. Kraemer, of the Kittanning Iron Works.

A number of experiments were made. Among them was one with Lake Champlain magnetite concentrates, both alone and with an admixture of cast borings. When the ore does not possess magnetite properties to a certain degree Mr. Ruthenberg uses cast-iron borings in order to create the arc, the percentage varying with the circumstances. When putting the ore through the machine alone the action is sluggish and the capacity suffers. The result of this operation is a fritted material which is in much better shape mechanically for charging into the blast furnace than the crude ore. Mr. Ruthenberg makes the important point that during the exposure of the ore to the action of the electric arc a considerable part of any sulphur in the ore is eliminated.

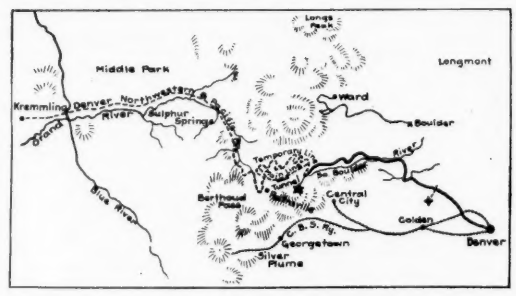
A somewhat more interesting operation is the direct reduction of iron ore in the electric arc. The fine ore is mixed with carbon in a suitable form, and if desirable cast-iron borings are also added. Exposure of the mixture in the electric arc causes a reduction of the iron oxide and there drops from the rolls a coarse, partly sintered material, which is largely iron in metallic form. This product is employed in the place of scrap in the open hearth furnace, one charge having been made with it at a leading steel plant.

The rated capacity of the machine at Lockport is about two and one-half to three tons of material per day of 20 hours, but we understand that a larger machine, with rolls three times as long, is being built which it is expected will reach a capacity of 10 tons per day. The electrical energy required for the Lockport machine is about 25 h.p.—*The Iron Age.*

Denver Northwestern & Pacific.

The Denver Northwestern & Pacific, known as the Moffat Short Line, will take the most direct line between Denver and Salt Lake, approximately 500 miles, which will result in a saving of 241 miles compared with the mileage of the Denver & Rio Grande between these points, and a saving of 128 miles as compared with the Union Pacific route. The possibilities of such a road have previously been considered, but beyond some surveys made by the Chicago, Burlington & Quincy a few years ago, nothing definite has ever been done until the present time. The Denver Northwestern & Pacific is to be run independently of the existing trunk line systems, and was financed, as is well known, through the personal efforts of D. H. Moffat, of Denver.

It will open up an extensive part of Colorado which has always been isolated from railroads, and is only accessible by stages or horseback journeys, and will pass through a region of ranches, coal fields, and mines, from which a good local traffic is expected.



The entire line has not been definitely located as yet, but surveys have been made to Kremmling, 130 miles from Denver. The road will start from the completed grade of the Denver & Northwestern, eight miles out of Denver, and will run northwest to Coal Creek, nine miles. A detour will then be made, and after crossing Coal Creek the line will follow the foot-hills for a distance of five miles until South Boulder Canyon is reached. It will then go up the canyon ten miles to the mouth of Black Canyon. The road will not keep to the water level, but will enter the canyon at an elevation of 800 ft. Passing through Black Canyon, the line will go through Rollinsville to the upper end of Boulder Park 12 miles. The contract for this section was let on Dec. 18 in five divisions, the first three, 19½ miles, going to Orman & Crook, of Pueblo, and the fourth and fifth divisions, 16½ miles, to George S. Good & Co., Lockhaven, Pa. There will be 25 tunnels on this section, in order to keep the maximum grade at two per cent.

The remainder of the route to Kremmling includes a loop back from the end of Boulder Canyon to Jenny Creek, from which point the road heads direct from the main range tunnel, a distance of 10 miles. This tunnel will be about two miles long. Until it is completed, a temporary line will be built around the mountains across Rollinsville Pass. The route then descends the mountains to Frazier Canyon, 31 miles; passes through the canyon, six miles, and continues to Sulphur Springs, a distance of 14 miles, and thence to Kremmling, 16 miles beyond, at a point where the Blue and Muddy rivers empty into the Grand river. The map shows the proposed line between Denver and Kremmling.

The Gas Engine.*

The simplest ideal form is a machine that pumps a small volume of air under a high pressure into a furnace, and draws out a large volume of gases at the same pressure and a very high temperature. The engine should then expand this gas down to the temperature of the air. The limits of the gas engine are essentially constructive, and the difficulties in the way of large gas engines are enormous. Theoretically the gas engine has a very great advantage. The possible range of temperature is so high that the mutivity‡ approaches unity. In addition to this the combustion, whether inside the engine or not, is very efficient. But a reciprocating engine cannot work at the temperature of burning carbon, or hydro-carbons, so that furnace gas at, say, 2,000 deg. A. cannot be led along pipes and used in a reciprocating engine. If the mutivity is sacrificed and the furnace gases diluted with cold air from the pump this plan is inferior. The high temperature can be used by burning inside a cylinder or explosion chamber cooled by water. The hot gas is then surrounded by a cool layer, but most of it is at a very high

*Extract from the Presidential address delivered by Mr. James Swinburne before the Institution of Electrical Engineers, England, Dec. 4, 1902.

‡"Mutivity" is a contraction of mutativity and means the changeability of the heat into other forms of energy.

temperature. Then we come on two difficulties. First, if the gases are exploded there is great strain on all the working parts. Next there is difficulty about the expansion. It would be good to make the engine compound, but then the valves give trouble. When gas engines have the field to themselves and compete closely, the compound gas engine must come in.

At present we waste a great deal of energy in the exhaust, and we have to make the cylinder large enough for the expansion, and strong enough for the explosion. Then as the exhaust is chemically different from the original mixture we must either have the power by using the Otto or Rochas cycle, or we must adopt some other method of scavenging, or use an auxiliary compression pump. If a certain range of temperature is available, it is better to have it at a low temperature, so that the mutivity is greater. Raising both temperatures is like hoisting a reefed sail higher without unreefing it.

We have thus in the gas engine a machine which from a thermo-dynamical point of view ought to be exceedingly good; but the difficulties in building, especially very large engines to utilize the high possible mutivity, and saving by having the heat produced where used, reduce the efficiency of the gas engine enormously. In spite of that, the large gas engine seems likely to oust the steam engine for large powers during the next few years. The best way to get high efficiency out of a gas engine would probably be to make it compound, exhausting at a temperature suitable for raising steam. The steam engine would then exhaust at a temperature suitable for raising SO_2 vapor. But the chances are that Dowson, Mond, or other producer gas will be available at such low prices that the extra steam and dioxide engines would not pay for attendance, interest, and depreciation. With very cheap gas the first thing is to make big engines, the next to make them so that they never break down, and the last thing to make them efficient. The gas engine may be, comparatively speaking, in the state Watt left the steam engine, but it will doubtless make very rapid advances, as it is in the hands of very competent and highly-educated engineers.

Traffic on the Kaiser Wilhelm Canal.

As reported by the *Riga Industrial Gazette*, the available statistical data on the traffic of the Kaiser Wilhelm Canal during the first full six years from July, 1895 to 1901, show a total of 145,159 ships as having passed the canal. The total net registered tonnage was 17,450,609, and passage charges equal to 9,078,621 marks, or about $2,270,000, have been paid. The traffic during the above six years is as follows:

	Ships.	Net Reg. tons.	Tolls in marks.
1895-96	16,834	1,507,983	888,780
1896-97	22,081	2,036,861	1,047,900
1897-98	23,149	2,648,347	1,363,085
1898-99	26,254	3,205,855	1,734,179
1899-1900	26,527	3,703,574	1,894,969
1900-01	30,314	4,347,989	2,149,708
Total	145,159	17,450,609	9,078,621

As seen from the above table the number of ships has increased in the sixth year by 80 per cent., the number of net registered tons by 188 per cent., and the tolls collected by 142 per cent., as compared to the first year. It is true that even the sixth year has not yet reached the estimated traffic of 5,500,000 tons, and the income was not yet sufficient to pay all expenses of management and maintenance, but many additional improvements have been made during the year. It may be mentioned that the Kaiser Wilhelm Canal had already in its fourth year more traffic than the Suez Canal has had in its tenth year, namely, 3,205,855 tons, as against 3,057,421 tons, without counting warships in the former canal.

TECHNICAL.

Manufacturing and Business.

The American Locomotive Company has opened offices in London at 26 Victoria street, S. W.

The new car shops recently built by the British Columbia Electric Ry. Co. at New Westminster, B. C., are now in operation.

The Westinghouse Brake Co., of London, has declared a semi-annual dividend of 10 per cent., and an extra dividend of 5 per cent. The capital is $2,000,000, and the stock is controlled by the Westinghouse Air-Brake Co.

The Temiskaming Railway Commission has given a contract to the Toronto Forge & Bolt Co., Toronto, Ont., for track bolts for 60 miles of main line and five miles of siding. The Pillow & Hersey Co., of Montreal, will supply spikes to cover a like distance.

Kern Dodge, of the firm of Dodge & Day, modernizing engineers, of Philadelphia, read a paper before the Franklin Institute on Jan. 22, on "Power Cranes in Machine Shops." This paper with illustrations is to be printed in full in the *Journal of the Franklin Institute.*

"The largest building in Pennsylvania," according to a letter in the Pittsburgh *Gazette*, "stands in old Butler town. The structure is 1,850 ft. long and varies from 340 to 500 ft. in width. It was erected in less than three months and houses the main plant of the Standard Pressed Steel Car Company, one of the youngest and most thriving industries in the State."

McCord & Co., Chicago, are sending out a clever advertising souvenir to their friends and patrons. It is an ink-stand in the form of a miniature reproduction of the McCord journal box. It is made of white metal, painted black, and is perfect in every detail, the dust excluding features being faithfully brought out. The device forms a neat and serviceable addition to the desk.

The Cleveland Automatic Stoker Co., Cleveland, has been organized to make a patent automatic stoker. The inventor and patentee is Frank Gorman, of Toledo. Wm. F. Malone, of the Buckeye Paint & Varnish Co., of Toledo, is president, and Frank Gorman, secretary of the company. J. A. Stone, Wm. Monaghan and Wm. T. Cashman, of Cleveland, are on the board of directors. A plant will be built in Toledo.

W. L. Reid has been promoted from Assistant Superintendent of the Brooks Works of the American Locomotive Company, to Superintendent of the new works at Schenectady. The appointment was effective Jan. 1. On Jan. 15, R. H. Gilmour, formerly Superintendent of the Canada Foundry Company (General Electric Company) of Toronto, Ont., was appointed Superintendent of the Brooks plant. Mr. Shea, formerly of the Schenectady works, has gone with the new locomotive works at Montreal.

The new plant of the Baltimore Rolling Mill Co. at Canton, Baltimore, was put in operation Jan. 19. The building is 52 ft. long and 155 ft. wide. The finishing room is expected to be put in operation March 1. The company contemplates building a bolt plant to make 600 tons a year. The puddling mill has an annual capacity of 9,000 tons, and the finishing mill will have an annual output of about 30,000 tons. The company makes different kinds of iron and steel specialties and employs about 100 men.

Frank J. Bramhall, who has just taken the position of Chief of the Advertising Department of the Southern Pacific at San Francisco, was formerly with the Michigan Central in a similar capacity, and is the dean of the corps of railroad advertising men in Chicago. He was born in Albany, N. Y., and has held several government positions. Mr. Bramhall's place on the Michigan Central will be filled by his brother, John T. Bramhall, who was for a number of years on the editorial staff of the *Evening Journal* and *Albany Times*, and for the past few years has been in charge of the advertising department of the Chicago, Indianapolis & Louisville.

In a neat pamphlet entitled *Expansion in the Southwest* the Sherwin-Williams Co. announces the establishment of division headquarters at 1400 St. Louis avenue, Kansas City, Mo., to handle the business in the southwest. This change from a depot to a division headquarters was necessitated by the rapid increase in business in the section named. The pamphlet also gives some account of the growth of the Sherwin-Williams Co. from the time of its founding in 1866 to its present magnitude; shows views of the various plants, division headquarters, depots, etc.; and devotes some space to an explanation of the quality of material manufactured by that company.

Iron and Steel.

The John Inglis Co., Ltd., has been organized at Toronto, Ont., with $250,000, to take over the foundry and machine business of John Inglis & Sons.

The Pittsburgh Engineering Co. has reorganized and the following officers elected: Guy P. Shurber, President; Lawrence R. White, Vice-President; H. L. Kerr, Secretary; Joseph Stewart, Treasurer. The capital stock is $125,000.

Efforts are being made to consolidate all the producers of emery, corundum and other abrasives. The proposed consolidated company is to have a capital of $10,000,000. Frank M. Atterholt, of Akron, Ohio; Josiah B. Espy, of Springfield, Ohio, are interested.

Ferdinand Protzman, Sr., said to be the first to make tin plate in the United States, and for many years connected with various manufacturing establishments in the country, died at his home in Pittsburgh last week at the age of 63. He was also interested in the new Norwalk Iron & Steel Co., and in a large steel car plant in Pennsylvania.

Sheffield Car Company.

The Sheffield Car Co., which has been in business some 25 years at Three Rivers, Mich., is having plans made by Stevens & Blume, architects and engineers, of Detroit, for a new foundry building 250 x 90 ft., of brick and steel fireproof construction, and to be equipped with electric cranes and divers other modern equipment for foundries. The Sheffield Company makes hand cars, mining cars, logging cars and equipment of similar making, and gasoline engines.

New Ferryboats for the Erie.

Contracts were let Jan. 22 by the Erie Railroad for three new ferryboats for service between Jersey City and New York. The United States Ship Building Co. will build two and the Burlee Shipbuilding Co. one. The boats are to be about 225 ft. long and 64 ft. wide, and are to have propellers at each end. Special attention has been given to the question of cabin ventilation. The interior finish will be in mahogany and cherry. Two of the boats will be in service by Nov. 1 and the third by Dec. 31.

American Bridge Company's New Offices.

The American Bridge Co. (manufacturing company), the American Bridge Co. of New York (selling and erecting company), and the A. & P. Roberts Company have moved their principal offices, formerly located at Pencoyd, at No. 259 South Fourth street, Philadelphia, and at No. 100 Broadway, New York, to the Pennsylvania Building, at the corner of Fifteenth and Chestnut streets, Philadelphia. The offices of the American Bridge Co. now in the new location are those of the president, the assistant to the president, vice-president, mechanical engineer, chief engineer, auditor, assistant auditor, statistician, traveling auditor and the accounting department of the purchasing agent, formerly located at Pencoyd, and the purchasing agent (except the mill order office), Eastern Division representative and traffic manager, and the treasurer. The offices of the American Bridge Company of New York now located in the Pennsylvania Building are those of the vice-president, chief engineer of erection, auditor, assistant auditor, statistician, traveling auditor and accounting office of the purchasing agent; formerly located at Pencoyd; the purchasing agent (except the mill order office). Eastern Division representative, manager of ornamental department, traffic manager and contracting manager, formerly located at Philadelphia, and the treasurer from New York. The mill order office of the purchasing agent for both companies, formerly located at Philadelphia, has been removed to Pencoyd.

Examination For Civil Engineers, United States Navy.

The Navy Department has published a circular, advertising the examination for two, and perhaps three, appointments to the Corps of Civil Engineers. Applicants will be required to pass physical, mental and professional examinations, to be held on Feb. 23 in New York and Chicago, and the appointees will enter the Corps with the rank of Junior Lieutenant and pay of $2,700 per annum. At the end of five years the pay will be increased to $3,000, and at the end of ten years to $3,500. The Senior Civil Engineer at the principal yards is furnished with quarters by the Government. Rank in the Corps is from Junior Lieutenant to Captain, with the Chief of the Bureau of Yards and Docks, at the head, with the rank of Rear Admiral and pay and allowances amounting from $6,200 to $6,500 per annum. Officers in the Corps on arriving at the age of 62, or if disabled in the line of duty, are retired on three-fourths full duty pay. The Corps at present numbers 25 members. It is hoped and expected that Congressional action will be taken at the present session increasing the Corps to 40. The Corps is a growing one and one of the most important in the service. It has charge of all improvements, including the large dry docks, at all navy yards and stations, comprising 10 large yards at home, and 12 stations scattered over the world. It is charged with the expenditure of some seven to eight millions of dollars annually in the way of public improvements at these various yards and stations, and offers an attractive field for able and ambitious engineers.

Japanese Government Iron Works.

The Government iron works at Wakamatsu, Japan, in which it is said the sum of 20 million yen has been sunk, but without satisfactory results, has finally been handed over to private capitalists, who will have acquired complete control within a few years. The failure of the government officials to successfully manage this establishment has been apparent for some time, but, as in all similar undertakings, it was necessary that the situation become desperate before anyone arose with the courage to see the true state of affairs and to lay the facts plainly before the government and the public. The trouble seems to be that native Japanese assumed the grave and delicate responsibilities of running the foundries and other mills before they had properly qualified themselves. Our correspondent, who sends us these facts, says that notwithstanding the radical change which is now to take place there is no hope of any foreign experts being employed, and there is no sign of any opening for American capital in this direction. American money might be accepted, but only under conditions which the American capitalist would not listen to. Japanese jealousy of the controlling effect of foreign money is extremely strong.

The Fritz Medal.

At a meeting of the Fritz Memorial Committee, held in New York on Jan. 23, the announcement was made that the four national engineering societies have appointed the following as their representatives on the Board of Trustees of the Fritz Medal:

American Society of Civil Engineers.—J. James R. Croes, New York, one-year term; Robert Moore, two-year term; Alfred Noble, New York, three-year term; Charles Warren Hunt, New York, four-year term.

American Institute of Mining Engineers.—E. E. Olcott, New York, one-year term; E. G. Spilsbury, New York, two-year term; James Douglas, New York, three-year term; Charles Kirchhoff, New York, four-year term.

American Society of Mechanical Engineers.—Gaetano Lanza, Boston, Mass., one-year term; John E. Sweet, Syracuse, N. Y., two-year term; Robert W. Hunt, Chicago, Ill., three-year term; S. T. Wellman, Cleveland, Ohio, four-year term.

American Institute of Electrical Engineers.—Arthur E. Kennelly, Cambridge, Mass., one-year term; Carl Hering, Philadelphia, Pa., two-year term; Charles P. Steinmetz, Schenectady, three-year term; Charles F. Scott, Pittsburgh, Pa., four-year term.

A preliminary organization of the Board of Trustees was effected and a committee was appointed to prepare the way for a permanent organization.

European Locomotive Notes.

The administration of the Austrian State Railroads have decided to fit all their engines running in Galicia to use oil fuel; the contract for the supply covers a long term of years.

The North British is reported to be building some large six-coupled 10 wheel engines for express service in the coming summer. They are to have a cab of the American pattern as modified and in use on the North Eastern line.

The Great Western has now in service 20 moguls for freight, all of which are fitted with the extended wagon top boiler.

The Electrical Equipment on the North-Eastern.

The contract is reported let to the British Thomson-Houston Co. to electrically equip 37 miles of the North-Eastern, near Newcastle-on-Tyne, England. It calls for electrical equipment and trucks for 50 motor cars, and for the electrical connections for 50 additional trailers. The Thomson-Houston Co. will also provide the third rail, track bonds, etc.

American Locomotives in France.

Through the courtesy of the Locomotive Superintendent of the Paris, Lyons & Mediterranean on a recent trip to the South I was enabled to observe one of the new Baldwin Atlantic-type engines on the train de luxe for the first stage out of Paris, with a load of just under 200 tons. We ran the 97 miles with two slows and two stops in a running time of 122½ minutes gross. The running was much better from point to point than in my trips of last year with the C21 to C60 class of compounds. The final 26¼ miles, all up hill, took only (to the stop) 28½ minutes. The net time was only 117 minutes. The engine seemed to make nothing of the load though I should judge that she was worked very light. They are reported to burn more coal than their own engines, but ought to do more work. I must express my thanks to M. Baudry for arranging for the engine to work that train, as it is not its usual run. R. HOPE.

O. R. & N. Bridges For 1903.

The Oregon Railroad & Navigation Co. proposes to build 23 single track steel bridges during the year 1903. They being all small spans from 20 ft. I-beams to 95 ft. through plate girders. The contractor for the construction of the steel work is the American Bridge Company. The erecting will be done by the railroad.

Rail Making in Canada.

Mr. James Ross, President of the Dominion Iron & Steel Company, says that the reason the Dominion Iron & Steel Company has not gone on with building the steel rail mill is that "it was not considered feasible under the present conditions of the tariff. The mill will be built when the Government has placed a duty on steel rails that will enable us to cater for our share of the Canadian market. What we need is increased protection all the way from the raw material to the finished product. Conditions have greatly changed in Canada during the past few years, and we have now reached a stage at which we can place a protective tariff on all lines of manufactures that it is to our interest to have protected." Notwithstanding the above statement by Mr. Ross, it is reported from Montreal that the company has just arranged to build a small rail mill at Sydney, C. B., of 400 tons daily capacity, and to be ready May 1.

Record Output by Edgar Thomson Furnace.

During 24 hours ending Sunday morning, Jan. 18, blast furnace D of the Edgar Thomson plant of the Carnegie Steel Co., at Braddock, Pa., made 705 tons of iron. During this period there were seven casts, several of them amounting to considerably over 100 tons. This furnace is one of the oldest of the 11 furnaces of the Edgar Thomson group and was built 23 years ago under the supervision of the late Capt. William R. Jones. It has not been rebuilt and the only new features added to the stack are the automatic skip hoists.

The Panama Canal.

It is very gratifying to note that the treaty with Colombia in the matter of the Panama Canal has been signed by the two powers. It is thought that it will be ratified by the Senate without much difficulty, although, of course, Mr. Morgan will muster all his forces to defeat it. The treaty provides for an annual rental of $250,000 and a cash payment of $10,000,000. The rental begins at the end of nine years.

United States Steel Corporation Improvements.

The presidents of the subsidiary companies of the United States Steel Corporation met in New York City last week to pass on the improvements to be made at the various plants, and to formulate plans for still further economies in the management of the corporation. There will be another meeting about March 1. The statement given out does not give any details as to what work is to be done.

Mr. Schoen's Car Wheel Plant.

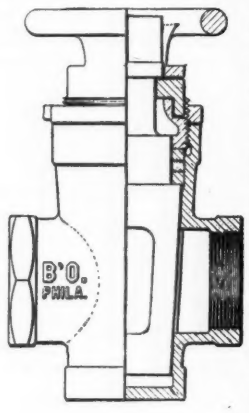
All the engineering work in connection with the new car wheel plant to be built by Mr. Chas. T. Schoen at McKees Rocks, near Pittsburgh, Pa., has been intrusted to the Garrett-Cromwell Engineering Co. of Cleveland, Ohio. It is said that the plant will cover some 20 acres, which land was bought some time ago.

The Locomotive & Machine Company of Montreal.

Some important contracts are now being let for the equipment of a large locomotive works which are to be built in Montreal by the Locomotive & Machine Co. of Montreal. Some $300,000 worth of equipment is being bought. The plant adjoins the St. Lawrence on Longue Point, and it is estimated that the output of locomotives the first year will be about 100. Later it is intended to extend the scope of the work to take in bridge work and ship building. All machinery in the plant is to be electrically driven. M. H. Haney, of Toronto, is President; G. P. Brophy, of Ottawa, is the Managing Director, and R. T. Shea, formerly with the Schenectady Locomotive Works, will be Superintendent. It is expected that the plant will be in operation by August. The general office is in the Street Railway Chambers, Montreal.

The Bordo Blow-Off Valve.

The Bordo valves have been on the market for several years and are primarily intended as blow-off valves on boilers. A number of improvements in the design have been made since we last published a description of the same. The valve is operated with a wrench on the square of the plug. The hand wheel is fast to the packing gland, which when adjusted is permanently fixed by a lock-nut. By turning the hand wheel to the left the plug is lifted so that it can be made to turn easily at all times. When the lock nut is moved up to under the wheel a lifting cam (which couples the packing gland to the plug) can be pulled out, and the gland is then free to be removed for repacking. It is made by the Bordo Valve Company, Philadelphia, Pa.



Stanley Electric Mfg. Co.

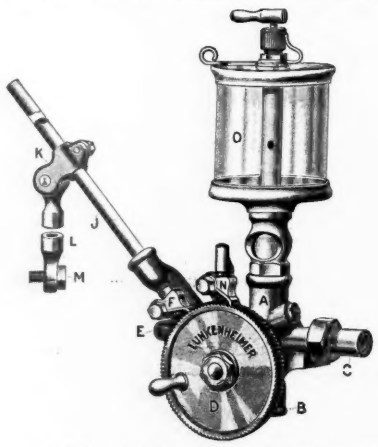
Negotiations have nearly been completed for the transfer of a controlling interest in the Stanley Electric Manufacturing Company, of Pittsfield, Mass., to a syndicate of New York capitalists. The stock will be taken over at 125. It is expected that the negotiations will be completed within a fortnight. The plant will remain at Pittsfield, and its capacity will be enlarged. It is said that the company will engage in new and larger fields in the manufacture of electrical machinery.

Fences and Cattleguards.

The Committee on Signs, Fences, Crossings and Cattleguards of the American Railway Engineering & Maintenance of Way Association wishes, in making its report to the association, to submit therewith plans of all fences and cattleguards now manufactured and on the market. In order that all firms may be represented, the committee requests that each firm submit, if possible, within the next two weeks, a plan, elevation, and such sections as may be necessary, of any fence and cattleguard manufactured by such firm, whether patented or not. To be accepted, these plans must conform to certain specifications, which may be obtained from L. C. Fritch, secretary, 1562 Monadnock Block, Chicago.

A New Mechanical Oil Cup.

The method of lubrication shown herewith is more reliable than that obtained by lubricators hydrostatically operated, and, when properly constructed, the oiling is absolutely positive. Referring to the illustration it will be seen that the driving mechanism is of the ratchet type



and is operated by clutches (*F*) and (*N*) operated by the motion of the rod (*J*), which can be attached to the eccentric rod, or other moving parts of the engine, by the couplings (*K*) and (*M*). The motion thus obtained is transmitted to the piston (*E*). The ratchet wheel (*D*) is provided with a handle whereby it can be rotated by hand, as for example, when starting the engine. By moving the part (*K*) up or down the rod, the stroke of the pump can be changed, thus regulating the amount of oil fed by the pump independent of the feed from the oil cup. The joints of the cup are tight, and the use of check valves in the pump prevents flooding. The outlet (*C*) is piped to the steam pipe or chest of the engine. The ratchet wheel (*D*) and pawls (*F*) and (*N*) are made of tool steel, tempered and hardened. All other metal parts about the pump are bronze. It is made by the Lunkenheimer Company, Cincinnati, Ohio.

THE SCRAP HEAP.

Notes.

The Cleveland, Cincinnati, Chicago & St. Louis has just put the block system into effect on the main line of the St. Louis Division.

There is a proposition before the Legislature of Alabama to have the State Railroad Commission elected by popular vote, instead of being appointed by the Governor.

An officer of the Pittsburgh (street) Railways Company tells a reporter that his company wants 200 conductors and motormen, and is unable to find competent men to fill the places.

A nine-hour day, two weeks' vacation with pay, every other Sunday off, and a 12 per cent. increase in wages are said to be the points in which the telegraph operators employed by the Baltimore & Ohio have had the conditions of their employment lately ameliorated.

The general passenger agents, the assistant general passenger agents and the district passenger agents of the Pennsylvania Railroad and of the Pennsylvania Lines West of Pittsburgh; that is to say, of the whole Pennsylvania system, held a two days' meeting in Philadelphia last week.

Evidence has been presented before the Grand Jury at Paterson, N. J., tending to show that persons in that city have bought season tickets over the Erie Railroad between Paterson and New York at $5.80 each, monthly, and have made a business of lending them to transient parties at a considerable profit.

As is well known, a number of branches of the Pennsylvania Railroad between Altoona and Pittsburgh are managed by telephone; that is to say, a "train director," acting for the train despatcher, sends all train orders by telephone. This method has just been introduced on two additional divisions or sections; the Unity Branch, from Latrobe to Whitney, and the Alexandria Branch, from Donohoe to Salemville.

According to the *Topeka Journal* the Chicago, Rock Island & Pacific now limits the season tickets of the editors of country newspapers to six months, and no longer grants the trip passes heretofore given for the members of editors' families. The renewal of the "annuals" twice a year is required because it has been found that the transportation was sometimes misused; editors who sold out their papers forgot to deliver the railroad transportation to the new proprietor.

Louisville papers say that the Louisville & Nashville has agreed to give its enginemen and firemen an increase of 10 per cent. in their wages. Other recent increases are: Delaware & Hudson, freight and yard conductors; Baltimore & Ohio, conductors, brakemen and yardmen; Atlantic Coast Line, conductors; Southern California, yardmen at nearly all of the cities on the line; Lake Shore & Michigan Southern, station agents and clerks. The indefinite character of most of the press despatches on this subject makes it impossible to state the facts in detail.

Western papers say that officers of the Rock Island road have declined to accept complimentary annual passes from the Pennsylvania Lines West of Pittsburgh because the passes do not cover also the lines east of Pittsburgh; and the same thing occurred in connection with the Baltimore & Ohio. Other roads west of Chicago are said to have accepted the passes, and to have sent, in return, passes of their own issue limited to a part of their lines. The Chicago reporters say that the roads west of Chicago are disturbing the pass agreement by giving a liberal interpretation to the rule about issuing passes to agents of fast freight lines.

Railroad Pensions.

The pension department of the Pennsylvania Railroad has closed its third year, and the total amount which has been paid in pensions during the three years is $864,713. One thousand eight hundred and fifty-one employees have been retired and put on the pension rolls, and of this number 381 have died. Pensions are now paid by 12 American railroads, namely, Baltimore & Ohio, Chicago & North Western, Grand Trunk; Delaware, Lackawanna & Western; Illinois Central, Pennsylvania, Pennsylvania Lines West of Pittsburgh, Philadelphia & Reading, Union Pacific, Southern Pacific, Oregon Short Line, Oregon Railroad & Navigation Co. A press despatch from Roanoke, Va., says that the Norfolk & Western has decided to pension its old employees, but we have as yet no official confirmation of the report. The Metropolitan Street Railway, of New York City, employing over 15,000 men, pays pensions to superannuated employees who have been members of the Metropolitan Street Railway Association (of employees).

Disastrous Rear Collision at Cranford, New Jersey.

In a rear collision of westbound passenger trains on the Central Railroad of New Jersey, Tuesday evening, January 27, a short distance west of Cranford, N. J., 16 miles from Jersey City, 20 or more passengers were killed and 50 or more injured. The wrecked cars took fire from the locomotive which ran into them and some of the victims were burned to death. The Easton express, a train of eight cars, had been stopped for the purpose of cooling a hot journal, and it was run into at the rear by the Philadelphia express, leaving Jersey City at 6:13 p.m., the latter being a very fast train. The three rear cars of the leading train were completely wrecked and the fourth car from the rear was badly damaged. Many passengers were killed instantly and the scenes following the wreck were heartrending in the extreme. The engineman and fireman of the Philadelphia express were injured, the former fatally. The Easton express ordinarily runs from the inner to the outer one of the two westbound tracks at Cranford, but on this occasion it continued on the inner track in consequence of a freight train having been delayed on the outer track. This section of the road is equipped with automatic block signals, and it appears to be agreed that the signal was standing against the Philadelphia train. The accounts also indicate that numerous witnesses (apparently at or near Cranford station) testified to seeing the brakeman of the standing train swinging his red signal in the face of the Philadelphia express. The general manager of the road, as reported in the New York *Sun*, says that the signals were in proper working order, as they were

found so immediately after the collision, and that the engineman must, therefore, have disregarded the signal. An eastbound passenger train was considerably damaged by the wreckage.

The grade approaching the point where the collision occurred is slightly ascending, and there is a clear view for miles. The distance from the rear of the Easton train back to the home signal was about 900 ft., and to the distant signal about 3,000 ft. The signals are the Westinghouse electro-pneumatic, normal-clear; and there appears to be no question that both home and distant were in perfect order, and therefore were against the Philadelphia train. The practice on the Central of New Jersey, with automatic block signals is, we believe, the same as that of the Boston & Albany, where trains are not required to come to a full stop when finding a home signal against them; they are to reduce speed to three miles an hour and proceed only as the way is known to be clear.

Cash for the Pennsylvania.

A loan of $35,000,000, with interest at 4½ per cent., has been negotiated by the Pennsylvania Railroad in the New York market for a period of six months, with the privilege of renewal for an additional six months. First Vice-President Green is quoted as saying that the money is for immediate use to relieve the congestion of the Pittsburgh district. It is proposed to build and enlarge yards and lay more track at a number of points, both east and west of Pittsburgh, and the loan will be retired by the subsequent issue of stock, which is to come up for authorization at the next meeting of the shareholders.

European Notes.

The Paris, Lyons & Mediterranean has in service some large bogie freight cars. They are steel and similar to American practice.

The Northern of France has just ordered 10 more locomotives of the 2.643 class. They will be built in the North and not at Belfort, where they are very busy indeed.

In Europe there are several ways of classifying engines; in Austria the first three figures of the number denote the series, i. e., 17002 is No. 2 of series 170, and so on. On the Nord of France, the first figure denotes the number of coupled axles and is divided from the subsequent numbers by a stop, so all the 4-coupled are 2.000, all the 6-coupled are 3.000, and all the 8-coupled are 4.000. One has to remember the class number as well. On the P. L. M. the express engines are prefixed by a C, and are numbered in two classes, C21 to C60, and C61 to C180. R. HOPE.

The Railroad to Mecca.

A recent bulletin of the American Geographical Society gives an account of the projected road between Damascus and Mecca. The distance by rail will be about 1,250 miles, as the Hauran R. R., already completed, will be used for 63 miles south of Damascus. The Mecca road proper will be a little less than 1,200 miles long. The estimated cost is over $40,000,000, and the Sultan is depending upon voluntary contributions for the necessary funds. Work was begun during 1901 by means of contributions to the amount of approximately $2,000,000, which had been received at that time, and it was hoped that the grade would be completed to a point 125 miles south of Damascus last summer. The projected line follows an old pilgrim route through the desert, and the resources of the country passed through are little known. The railroad appeals to good Mohammedans because it would enable those dwelling in the more remote regions of India, Java, etc., who now reach Mecca by way of the Red Sea, to visit both Mecca and Medina, whereas the majority must now confine their pilgrimage to Mecca. The Turkish Government has also an exceedingly practical interest in the route, since at present the movement of Turkish troops between the Holy City and Turkey is very difficult. The work thus far is in charge of German engineers, with assistance from the Turkish Military Engineering Corps.

Coaling Station for the Lehigh Valley.

In the southern part of the city of Newark, N. J., the Lehigh Valley is building a coaling station, which is to be 1,100 ft. long and some 65 ft. high. It is built of material as near fireproof as possible. The storage capacity is 20,000 tons. It contains 155 bins or pockets.

British Shipbuilding.

It is a sufficiently appalling fact for the shipowner, brooding over the depressing figures of his balance-sheet for the year just closed, that in the year 1902 no less than 1,619,000 tons of new vessels were put into the water in the United Kingdom alone. Various returns have been published: some of Board of Trade, some of builders', and some of mixed measurements, but the figure we have adopted seems to be as closely approximate as one can get. True, it includes warships (on displacement tonnage), of which 51,600 tons were launched in the Government dockyards, besides what were turned out by private builders, liners for exclusive employment, and such structures as pontoon docks, dredgers, barges, cable-laying steamers, trawlers, tugs, yachts, and launches, which do not affect the carrying trade of the world. But with all allowance for these, there can hardly be less than a million tons of competitive merchant shipping to swell the already over-swollen mercantile marine of the world. The contributions of the different shipbuilding centers have been as under, in comparison with 1901:

	1902.		1901.	
	Vessels.	Tonnage.	Vessels.	Tonnage.
England	937	891,520	876	1,092,760
Scotland	404	567,880	376	554,400
Ireland	27	159,630	23	151,920
Total	1,368	1,619,030	1,275	1,799,080

—*The Economist.*

The Overland Route.

A recent issue of *The Examiner* of Omaha contains an article explaining the origin of the name "Overland" and why it belongs to the Union Pacific. It had been contended that this name applied to any particular road was a misnomer as all trains run overland. The article states that the significance of the term has now almost passed away; but it had in the 60's and early 70's a meaning peculiarly its own as applied to the Union Pacific and Central Pacific. The term was used to designate the rail, or overland route in contradistinction to the route by sea via the Isthmus of Panama, and passengers desiring to go to the Pacific coast were required to signify whether they desired the "sea" or the "overland" route. As a result the term "overland" came to be generally adopted by the two railroad lines to which they were first applied.

Technical Colleges.

Washington University, St. Louis, Mo.—A pamphlet prepared under the direction of Chancellor W. S. Chaplin and issued last month by Washington University describes the group of 11 new buildings already erected or soon to be completed on the new site facing Forest Park. These new buildings will be occupied by the University Feb. 1, 1905. They were designed by Cope & Stewardson, of Philadelphia, in the Tudor-Gothic style of architecture, are most substantially built of red Missouri granite, and are thoroughly fireproof. All these buildings are two stories high, the lecture rooms and laboratories are large, well lighted and ventilated and supplied with all the latest improvements for scientific education. The principal buildings included in the group now building are: University Hall, the gift of Mr. Robert S. Brookings, which has cost $220,000; Busch Hall, the Chemical Laboratory, $110,000; Cupples Hall No. 1, Civil Engineering and Architecture, $110,000; the Library, given by the Louisiana Purchase Exposition Co., with stacks for 400,000 volumes, built at a cost of $250,000, and completing the first quadrangle; Cupples Hall No. 2, the Engineering Laboratory, Department of Mechanical Engineering and Power House (two buildings), costing together about $165,000; the Laboratory of Physics and two dormitories, costing $290,000. The total cost of the nine principal buildings now under construction will be about $1,300,000, and in the laying out of the grounds many other buildings have been provided for.

The Carnegie Institution.

At a meeting of the Executive Committee of the Carnegie Institution at Washington, D. C., last week, appropriations were granted to encourage work in 24 branches of science and to encourage exceptional talent by appointing a number of research assistants at fixed salaries not to exceed $1,000 each. Among the amounts granted were $4,500 for engineering; publications, $5,000; research assistants, $25,000; student research work in Washington, $10,000; astronomy, $21,000; chemistry, $1,500; and investigations of projects for physical laboratories, $5,000, the total amount allotted for 1903 being about $200,000.

Hindrances To a Royal Progress in Japan.

A Japanese prince wishing to travel over a section of the Nippon Railroad ordered a first-class car to be reserved for him at the local station where he was to get on. When the train arrived it had but one first-class car, and that was occupied by eight Europeans, who, when requested to vacate the car and find seats in a second-class car, showed their first-class tickets and declared that they would see His Highness further first. The Prince acknowledged their right to their places and accepted the accommodations of a second-class car for himself and his train, which its Japanese occupants vacated for him. All seemed settled to the satisfaction of all concerned, and the Prince left at his destination. But the police authorities heard of it, and their blood boiled, and at a station after the Prince had left the train they arrested the conductor for *lése majesté!* They put handcuffs on him and led him by a rope to a police court, which, however, was aware that feudal times are past in Japan, and dismissed the prisoner when it was shown that the Prince had been satisfied with his accommodations. Nevertheless, the Japanese think that the eight Europeans were boors.

The U. S. Naval Institute.

The gold medal given annually by the U. S. Naval Institute for the best paper on a subject nearly related to the Navy was last week awarded to Prof. Philip R. Alger, U. S. N., for his paper on "Gunnery in the Navy." The prize includes the gold medal, $100 in cash and life membership in the Institute. The following papers received honorable mention: "A Manual Training Plan and System," Lieut. J. H. Reid, U. S. N.; "Systematic Training of Enlisted Personnel of Our Navy," Lieut. C. L. Hussey, U. S. N.; "Our Torpedo Boat Flotilla: the Training Needed to Assure Its Efficiency," Lieut. E. L. Beach, U. S. N.

American Cars in Egypt.

The stock of wagons now consists of nearly 7,000 vehicles, of all descriptions. There are 570 30-ton wagons employed on the Egyptian State Railways, of which 300 are of American manufacture. The American wagons have not, however, been by any means a success. Although but a few years in use, they are exhibiting defects, whether of construction or of material, which threaten to put them out of service quite early in their career. The Hungarian cars (270 in number) on the other hand, are giving complete satisfaction, and will probably entirely supplant the much-vaunted American cars, which, however suitable they may be for the United States, do not appear to be able to stand the wear and tear of an Egyptian railway, or the peculiar effects of the Egyptian climate.—*The Railway News.*

Pay of Enginemen in Austria.

At a recent Congress of Austrian locomotive enginemen, it was voted to ask for a scale of wages, beginning at $240 per year and rising in the course of 20 years' service to $480.

LOCOMOTIVE BUILDING.

The Arizona Copper Co. is having one locomotive built at the Baldwin Works.

The Norfolk & Western is reported to have placed an order for three passenger locomotives.

The Kirby Lumber Co. is having three locomotives built by H. K. Porter & Co., Pittsburgh.

The Kiushiu (Japan) is having 12 locomotives built at the Schenectady Works of the American Locomotive Co.

The Chicago & North Western is having 10 locomotives built at the Schenectady Works of the American Locomotive Co.

The Copper Range, as reported in our issue of Jan. 9, is having three simple, standard gage locomotives built at the Schenectady Works of the American Locomotive Co. Two of these locomotives are to be moguls and one consolidation.

The Toledo Railway & Terminal Co. has ordered six simple switching locomotives from the Baldwin Locomotive Works. The locomotives will weigh 102,000 lbs., and have 18 x 24 in. cylinders, 51 in. drivers; wagon top boilers, with a working steam pressure of 180 lbs.; 233 iron tubes, 2 in. in diameter, 11 ft. 1½ in. long; firebox 84 in. long and 33 in. wide; tank capacity, 4,000 gallons of water and six tons of coal. The special equipment includes: Standard axles, Western automatic bell ringers, magnesia boiler lagging, Tower couplers, Buck headlights, Monitor injectors, metallic piston and valve rod packings, Coale safety valves, Leach sanding devices, Nathan sight-feed lubricators, standard springs and driving wheel tires and cast-steel wheel centers. Other specialties are: Steel cabs and tender frames and Player tender trucks.

CAR BUILDING.

The Louisiana & Arkansas has ordered 50 flat cars from the American Car & Foundry Co.

The Chicago, Peoria & Western has ordered 20 tank cars from the American Car & Foundry Co.

The Atlantic Coast Line is having 40 freights built at the Detroit Works of the American Car & Foundry Co.

The Delaware & Hudson is having 850 freights built at the Berwick Works of the American Car & Foundry Co.

The Chicago Great Western has ordered 20 eight-wheel, and six four-wheel cabooses from the American Car & Foundry Co.

The Alabama & Vicksburg (Queen & Crescent) is having 100 freights built at the Jeffersonville works of the American Car & Foundry Co.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 100 30-ton coke, and 100 40-ton hoppers from the American Car & Foundry Co.

The Indianapolis Southern is in the market for a full line of new equipment. This line is building between Rockport, Ind., and Indianapolis. E. M. Parry, Indianapolis, is President.

The Chicago, Burlington & Quincy, reported in our issue of Dec. 12 as having ordered 90 coaches from the American Car & Foundry Co., is having 40 of these built at the Jeffersonville Works of the American Car & Foundry Co.

The Kettle Valley Lines are in the market for 20 wooden hopper bottom ore cars of 30 or 40 tons capacity. The special equipment will include: Steel bolsters, standard steel brake-beams, standard brake-shoes, air-brakes and brasses, M. C. B. Tower couplers, Miner or Westinghouse draft rigging, standard journal boxes and lids, Spiral springs, four-wheel trucks and 33 in. cast-iron wheels.

The Cumberland Railway & Coal Co. has ordered six side dump coal cars of 80,000 lbs. capacity from Rhodes, Curry & Co., Amherst, N. S. The cars will weigh 43,500 lbs. and measure 34 ft. long, 8 ft. 6 in. wide and 9 ft. 2 in. high, to be built of wood, lined with steel, and have wooden underframes. The special equipment includes: M. C. B. axles, Simplex bolsters, National-Hollow brake-beams, Miner tandem draft rigging, M. C. B. journal boxes, oxide of iron paint, M. C. B. standard coil springs and 33 in. cast-iron M. C. B. standard Rhodes, Curry & Co.'s wheels.

BRIDGE BUILDING.

AKRON, OHIO.—The Osborn Engineering Co., of Cleveland, has made plans for the proposed Mill street viaduct which will be 765 ft. long and 21 ft. high. The cost will reach $135,000. The City Engineer can give information.

The Council is considering ordering a new bridge to replace the present structure on Perkins street. The present bridge is 30 ft. wide and the new one is to be 60 ft.

ALABAMA.—On Jan. 19 a bill was introduced in the House of Representatives and referred to the Committee on Interstate and Foreign Commerce authorizing the Commissioners of Geneva County, Ala., to build a bridge across the Choctawhatchee River.

ASBURY PARK, N. J.—The New York & Long Branch R. R., according to report, is getting plans made for a new station here.

ATTLEBORO, MASS.—The New Haven road has finished surveys and plans to abolish the grade crossings in Attleboro.

AUGUSTA, ME.—A bill has been introduced in the Legislature providing that the large bridges of the State be maintained by the county and State instead of by the cities and towns, as the law reads at present. The measure affects 434 wood, 157 iron, eight wood and iron, and four wood and concrete bridges of the State.

BALTIMORE, MD.—The question of who shall pay for rebuilding the bridge over Roland Run, destroyed last summer, has been decided. The city is to pay half of the cost.

BAY CITY, MICH.—Bids are wanted Feb. 14 by the Bay County Bridge Commission for rebuilding the floor system of the Lafayette avenue bridge. Blomshiled & McCoy, engineers.

BOSTON, MASS.—The State Board of Trade is considering means to have the city of Boston build a bridge over Fort Point Channel on the extension of Northern avenue.

BYRON, N. Y.—Mr. Wilgus, Chief Engineer of the New York Central, wants bids until Feb. 2 for building the under crossing of Main street in this town.

CAMDEN, N. J.—New bids are wanted Feb. 11 for the draw bridge over Cooper's Creek at Baird avenue. The lowest bid received Jan. 14 on this work was $30,950. The appropriation is $20,000. John J. Albertson, County Engineer.

CLARKSVILLE, TENN.—The Louisville & Nashville has decided to replace the middle span of its bridge over the Cumberland River at Clarksville. The work will cost about $75,000.

COHOES, N. Y.—Mr. Wilgus, Chief Engineer of the New York Central, wants bids until 3 p.m., Feb. 9, for building the proposed bridge over High street, this city.

CUYAHOGA FALLS, OHIO.—The Ohio Iron & Steel Specialty Co. is preparing to make additions to its plant.

DELAWARE, OHIO.—The Pennsylvania Co. will build a steel trestle over Sandusky street to replace the wooden structure now in use at a cost of $15,000.

FREDONIA, WIS.—Bids are wanted now by H. F. Beger for a 260-ft. steel bridge over Milwaukee River. The estimated cost is $8,000.

FRONT ROYAL, VA.—The Board of Supervisors of Warren County are considering building a 540 ft. steel bridge over the Shenandoah River. The kind of bridge to be built is not decided. T. V. Leach, County Clerk.

GAINESVILLE, GA.—The Gainesville & Dahlonega Electric Ry. will need one bridge of two spans each 150 ft. (See Railroad Construction column.)

GRIGGSTOWN, N. J.—It is said that a new bridge will be built over Millstone River, replacing the present structure at a cost of $3,000.

HARRISBURG, PA.—At present there are no less than five projects for bridges over the Susquehanna River in the vicinity of Harrisburg. The latest announced is that of the Pennsylvania R. R., to cross between Dauphin and Marysville. This structure is to cross the river at an angle of 45 deg., and is on the new low-grade freight line about to be built.

HAZELWOOD, PA.—A bill has been introduced in Congress authorizing a bridge over the Monongahela River at this place for the Eastern Railroad, which is the Pittsburgh link of the Pittsburgh, Niles & Western, to be built by Jones & Laughlin Steel Co.

HOUSTON, TEXAS.—The City Engineer is making plans for a bridge at Main street.

KANSAS CITY, KAN.—The City Council has amended the ordinance of the Kansas City, Outer Belt & Electric Ry., stipulating that the bridge to be built by this company across the Missouri River into Clay County be finished within six years. Messrs. Waddell & Hedrick, Consulting Engineers of Kansas City, Mo., are the engineers for the various bridges needed on this line.

KANSAS CITY, MO.—Plans for the proposed viaduct in Lydia avenue are being made by the Missouri Pacific road.

KNOXVILLE, TENN.—The Southern Ry. will replace all bridges not modern structures on the roads centering at Knoxville. It has already let contracts to the American Bridge Co. for 22 bridges.

LE ROY, N. Y.—Representatives of the Buffalo & Depew Electric R. R. have recently been in this village to arrange for building through this place and building a bridge over the Oatka at the foot of Main street.

LINCOLN, NEB.—The County Commissioners have adopted plans and specifications for new bridges in Lancaster County. Bids will be wanted soon.

LITTLETON, ME.—The Board of Selectmen will soon want bids for a 146-ft. steel bridge over a river at Littleton.

LODI, N. J.—Freeholders of Bergen County are considering putting a new bridge over Saddle River in Lodi Borough. (Address Hackensack.)

MARCUS HOOK, PA.—The Borough Council is considering an ordinance to permit the Philadelphia, Baltimore & Washington to build overhead bridges at Hewes and Blue Ball avenues.

MILWAUKEE, WIS.—The Board of Public Works, it is said, has decided to proceed with building the 27th street viaduct as soon as the money from the $100,000 bond issue is available.

MOUNT CARMEL, ILL.—The city has passed a resolution to appropriate $5,000 to the stock company now forming to build a wagon bridge over the Wabash River.

NEW BRUNSWICK.—Bids will be received by the Chief Commissioner of Public Works, Fredericton, N. B., Feb. 9, for rebuilding the draw span and approaches of Thoroughfare bridge, Sheffield, N. B.; for the masonry substructure and steel superstructure of a covered Howe truss bridge across the Shepody River at Harvey, N. B., and on Feb. 16 for rebuilding Porton bridge over the Eel River, Woodstock, N. B.

NEW CASTLE, IND.—Bids are wanted Feb. 9 by the County Commissioners for six steel bridges. John W. Whitworth, Chairman.

NEW YORK, N. Y.—A bill has been introduced in the State Legislature authorizing a bridge over Westchester Avenue in the Bronx.

NORFOLK, VA.—The Chesapeake Transit Co., in addition to its tunnel under Elizabeth River and its terminal in the city of Norfolk, proposes to build a viaduct about 2,100 ft. long across Lynnhaven River on the road to Cape Henry, Va.

OMAHA, NEB.—The Union Pacific contemplates building a viaduct at Ninth street and Capital avenue, but has reached no definite decision.

OTTAWA, ONT.—The Quebec & New Brunswick Ry., we are told, is asking power to bridge the St. John River at or near Connor's. The river at this point is the International boundary between the United States and Canada, or to be more definite, between the State of Maine and the Province of New Brunswick. Permission must also be had from Congress.

PITTSBURGH, PA.—Local reports state that the Union Bridge Co. has been ordered by the War Department to raise its bridge over the Allegheny River to 70 ft. above pool level; also that the company has decided to build an entire new bridge.

PLAINWELL, MICH.—The Township Board of Otsego proposes to build a steel bridge over Kalamazoo River within the village.

PROVIDENCE, R. I.—The question of abolishing the grade crossings at Acorn, Grove and Dike streets is under consideration by the Board of Aldermen. It is said the work will cost $200,000, of which the New Haven road will pay $155,000.

REDDING, CAL.—Plans have been made for the overhead crossing at North street. The proposed viaduct will be 377 ft. long, 24 ft. wide and 22 ft. high. The cost is estimated at $40,000. David M. Burson, City Engineer.

Alfred Baltzell has presented to the Board of Supervisors plans and specifications for the proposed bridge across the Big Bend of Pit River. The plans call for a Pratt truss of 147 ft. span. The estimated cost of the bridge is $5,500.

Mr. Baltzell has also presented to the board a profile and estimate of the proposed bridge across Pit River at Wyndam Ferry. A steel truss bridge with three spans of 100, 200 and 80 ft., respectively, is estimated to cost $11,000.

SAGINAW, MICH.—The contract for building the superstructure of the bridge over Cass River has been let to the King Bridge Co., of Cleveland, Ohio.

ST. PAUL, MINN.—The city and the Chicago, Milwaukee & St. Paul have reached an agreement in regard to building the bridge over Grand avenue. The bridge will be 75 ft. long instead of 150 ft., as originally intended.

SCOTTSDALE, PA.—Reports state that a new bridge will be built over Jacobs Creek in the spring.

SCRANTON, PA.—The Bureau of Engineering is ordered to make plans and estimate the cost of opening Hampton street, which requires a bridge over the Lackawanna tracks.

SHREVEPORT, LA.—The Shreveport Bridge & Terminal Co. is about to issue $1,000,000 of bonds to build its proposed bridge over Red River. All legislative permission has been granted. T. A. Alexander, of Shreveport, is President.

SOUTH BEND, IND.—The South Bend & Southern Michigan Ry. will need a 300-ft. span over the St. Joseph River; an arch under the Michigan Central R. R., and a steel viaduct over the Big Four and Michigan Central tracks. Contracts for the latter structure will be let soon. A. J. Hammond, of South Bend, Ind., is the Engineer.

SPENCER, IND.—Bids are wanted Feb. 3 by the County Commissioners for three small steel bridges. S. M. Kerr, County Auditor.

TACOMA, WASH.—The city council has rejected all the bids for the iron bridge, as they were too high. The Commissioner was directed to prepare plans and specifications for an iron bridge and advertise for bids for the construction of same, the cost not to exceed $7,500.

TORONTO, ONT.—According to local report, it is quite probable that the overhead bridge at the foot of Yonge street will now be built. The Mayor has given his approval.

TOWANDA, N. Y.—Reports state that Thomas W. Barrally, of Rochester, is making surveys for the State for a steel bridge over the Erie Canal between Seymour and Towanda streets.

TOWANDA, PA.—Local reports state that the Lehigh Valley has options on grounds along the river here, with the object of building a bridge across the stream.

UTICA, N. Y.—The City Engineer is reported to have plans on hand for a new bridge over the Mohawk River at the foot of Genesee street. The present bridge is deemed inadequate.

TACOMA, WASH.—The Public Works Department is asking bids for the new bridge to carry the Edison trunk sewer over the gulch near the city reservoir.

WASHINGTON, D. C.—The U. S. Senate on Jan. 24 passed the bill providing for laying a single track electric street railroad line across the Aqueduct bridge across the Potomac River. The bill was passed in exactly the form in which it passed the House of Representatives and will at once be sent to the President for signature. It authorizes the Commissioners of the District of Columbia to build such an addition to the bridge as will allow the installation and operation of a single track electric railroad, over which the cars of any electric railroad reaching the Virginia end of the bridge may cross into the District of Columbia. The cost of this addition, $35,000, is to be borne by the Great Falls & Old Dominion Ry. Co., or by the Washington, Arlington & Falls Church Ry. Co., and the track is to be used in common by that company and any other desiring to cross the bridge on terms to be agreed upon between them, or, if they fail to agree, by the Supreme Court of the District of Columbia. Two bills are pending before Congress for the entire reconstruction of this bridge, but neither is expected to pass at this session.

WAVERLY, TENN.—H. W. Hooper, of Bakerville, and J. T. Anderson, of Hurricane, are appointed a committee to get estimates for a bridge over Duck River, and report to the April term.

WAYNESBURG, PA.—The Green County R. R. (Wabash) will need a bridge about 1,000 ft. long over the Monongahela River at McCann's ferry. A number of smaller bridges and some tunnels are to be built and contracts will probably be let about April.

WHARTON, N. J.—The Morris County Connecting R. R. will build two plate girder bridges. One will have two spans of 60 ft. each, and the other will have a 70-ft. span. Address Edward Kelly, Manager, Wharton, N. J.

WHEATLAND, WIS.—The towns of Wheatland and Burlington will build a steel bridge over Fox River on the town line. A. R. Carnwell can give information.

WILLIAMSTOWN, MASS.—The Board of Selectmen will want bids soon after the first of March for a steel truss bridge over Green River at Main street. F. E. Moore, Chairman.

WINNIPEG, MAN.—The Canadian Northern Ry. has in contemplation a bridge over the Assiniboine River at Winnipeg, so as to run trains direct in and out of its proposed new station.

YANKTON, S. DAK.—The Yankton, Norfolk & Southern will soon place a contract for the bridge to cross the Missouri River.

Other Structures.

AUSTIN, TEXAS.—Pettibone, Mulliken & Co., of Chicago, Ill., propose to build a new factory at Austin, in which it will make track equipment. The company has 30 acres of ground and will put up two buildings, one 700 x 280 ft.; the other 280 x 200 ft.

BAKERSFIELD, CAL.—The California Consolidated Oil Fields Co. has recently been incorporated and will build five tanks of 35,000 gal. each, in the Sunset and Midway districts. It is said that these tanks will be of steel.

BRUNSWICK, GA.—The Mohawk Valley Steel & Wire Co., of Worcester, Mass., proposes to build a new plant at Brunswick.

CHESTERTOWN, MD.—The Philadelphia, Baltimore & Washington, according to report, is considering building a new station here.

DENVER, COLO.—The Western Boiler & Engine Works Co. has been organized by Milford T. Goss, formerly with the Denver Boiler & Sheet Iron Works Co. at Denver. E. B. Hasker is to be Superintendent of the new plant. The preliminary capital is $50,000, to be increased later to $150,000.

HOLLOWAY, OHIO.—The Baltimore & Ohio will spend a large amount of money on the Cleveland, Lorain & Wheeling branch, the work to include a division headquarters at Holloway; also a roundhouse with 26 stalls. A machine shop is to be equipped with most modern machinery. The division extends from Fairmont, W. Va., to Holloway.

LATROBE, PA.—The Pennsylvania R. R. has let a contract to Roydhouse, Arey & Co., of Philadelphia, to build a new passenger station here. It will be 120 x 41 ft. The main waiting room will be 40 x 30 ft.

LENOIR CITY, TENN.—Samuel Warfield, Manager of the Southern Car & Foundry Co., at Lenoir City, is reported as saying that that plant is again to make a large increase in its capacity. At present eight cars are made each day and it is proposed to increase this to 12. A new building 225 x 120 ft. will be put up and additional machinery will be needed.

MEMPHIS, TENN.—The Southern Ry. will probably be ready soon to begin work on its proposed station at Memphis.

MERIDIAN, MISS.—Local reports indicate that the union station question has been settled beyond doubt, and it is believed that work will be authorized soon.

MONONGAHELA CITY, PA.—The Coshocton Iron Works of Coshocton, Ohio, has about completed a new plant at Monongahela City and will begin operations in a few weeks.

MONCTON, N. B.—The Intercolonial is receiving bids for a coaling station at Moncton.

NAZARETH, PA.—The contract for four buildings of fire-proof material will be let by Davis & Co., structural engineers, Reading, Pa., Feb. 10.

NEWARK, N. J.—The car barns of the North Jersey Street Ry., which were destroyed by fire a short time ago, will be rebuilt as soon as possible.

The Lidgerwood Mfg. Co., builders of hoisting engines, has bought land on the line of the Pennsylvania south of Newark, where it will build a new plant to be ready in about a year.

NEW ORLEANS, LA.—The Supreme Court of Louisiana which had previously held that the petition of the Illinois Central for privileges to build wharves and make other improvements on the river front must receive the approval of the dock board, now declares that the city council was the supreme authority at the time the Illinois Central asked consent to undertake its improvements. This leaves the Illinois Central free to go ahead with its big terminal improvements.

PERU, IND.—It is now stated that the work of building the new shops for the Cincinnati, Richmond & Muncie in Peru, will be begun about April 1. The plans are understood to be well under way.

PHILADELPHIA, PA.—During the present year the Philadelphia & Reading will build a number of stations on its branches.

ST. LOUIS, MO.—James Stewart & Co., of Pittsburgh, have the contract from the Terminal Association of St. Louis for the alterations to the union station preparatory to handling the business at the time of the Louisiana Purchase Exposition. The total work to be done will cost about $1,000,000. The American Bridge Co. will supply all the structural work. These alterations were briefly mentioned in the *Railroad Gazette* recently.

SALT LAKE CITY, UTAH.—Peter L. Kimberley, of Chicago, and Frank H. Buhl, formerly President of the Sharon Steel Co., have organized a $10,000,000 stock company in this city to develop the iron and steel business in the State of Utah.

SAN BERNARDINO, CAL.—The Southern Pacific Co. proposes to spend about $150,000 improving the terminals here. The work will include a new passenger station, freight depot and a considerable amount of new tracks. The new station will be about 142 ft. long.

TOPEKA, KAN.—The bridge works now being built at Topeka will be owned by the Topeka Bridge & Iron Works. It is a branch of the Elizabeth Steel Bridge Works of Elizabeth, Ill.

WASHINGTON, D. C.—Meetings of the Conference Committee of the U. S. Senate and House of Representatives on the bill providing for the Union station for Washington, D. C., began on Jan. 21, and representatives of the Pennsylvania and the Baltimore & Ohio Railroads appeared in opposition to the provision inserted in the House increasing by $1,000,000 the amount to be paid by the two roads toward the improvement. Up to the adjournment of the Conference Committee on Saturday last no conclusion had been reached, but it seemed probable that on resuming its sessions early this week some change or compromise would be made from the House provision.

WATERLOO, IOWA.—The Waterloo Bridge & Steel Structural Co., it is said, is the name of a firm being organized in this city to engage in structural steel and bridge building business.

WINNIPEG, MAN.—The Canadian Northern proposes to build a new station in Winnipeg in such a position that trains may be run in and out without backing, as is necessary at present. It is also proposed to build a hotel adjoining the station.

The Canadian Pacific proposes to build new stations at Winnipeg, Man.; Fairville, N. B., and at Vanceboro, Me.

The Canadian Elevator Co. has decided to build some 70 odd elevators this year along the lines of the Canadian Northern.

WOONSOCKET, R. I.—Reports state that the New Haven road is planning to build a new station on the Air Line.

YOUNGSTOWN, OHIO.—The Youngstown Steel Casting Co. has increased its capital stock from $100,000 to $200,000, to allow for enlargement of the plant.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

The Traveling Engineers' Association.

The date for the next meeting for the Traveling Engineers' Association is Sept. 8, 1903, at Chicago, Ill. The address of W. O. Thompson, the Secretary, is care R., W. & O. shops, Oswego, N. Y.

Train Despatchers' Association of America.

The next convention of the Train Despatchers' Association of America will be held at Nashville, Tenn., on

the third Tuesday of June (16th), 1903. John F. Mackie, Secretary, 7042 Stewart avenue, Chicago, Ill.

The Engineers' Club of Philadelphia.

A conversational meeting of the club will be held on Saturday, Jan. 31, at 8 o'clock p.m. The evening will be devoted to a discussion of the "Manufacture and Uses of Asphalt." Mr. Henry Wiederhold, visitor, will read a paper on "Rock Asphalt and Asphalt Mastic." The Information Committee has arranged for an excursion to New York City on Saturday, Feb. 7, leaving Broad Street Station on the 7:33 a.m. train. The trip will be made without expense to the members. After an inspection of the plant of the Barber Asphalt Company at Long Island City, it is proposed to visit the New York Subway, now in course of construction, returning to Philadelphia in time to attend the regular meeting of the club.

Roadmasters' & Maintenance of Way Association.

The proceedings of the 20th annual meeting, held at Milwaukee, Wis., last September, have been published in pamphlet form and copies may be had from the Secretary, Charles McEnery, C., R. I. & P. Ry., Cedar Rapids, Iowa.

The 21st convention will be held at Kansas City, Mo., Oct. 13, 14 and 15. The committees for 1903 are: Best Method of Maintaining Line Surface and Gage, E. Morrill, B. & M., Chairman; the Best Method of Educating Young Men to Make Foremen of Them and Discipline of Section Men, M. Sullivan, M. C. Ry., Chairman; New and Improved Appliances for Use on Maintenance of Way, C. Buhrer, L. S. & M. S., Chairman; Track Drainage and Tiling, J. M. Meade, A., T. & S. F.; Wooden, Metal and Composition Ties and Tie Plates, and Preservation of Ties, J. E. McNeil, S. C. R. R., Chairman; Machine Ditching, A. L. Mead, C. & N. W., Chairman; Committee on Arrangements, C. E. Jones, C., B. & Q., Chairman.

The papers for the 1903 meeting are: "Advisability of Putting in 60 ft. Rails to Take Joints Out of Crossings," J. A. Lahey, C. T. T.; "General Track Work," A. Morrison, Cambria Steel Co.; "Timber Preservation," Hermann Von Schrank, Mississippi Valley Laboratory; "Creeping of Rails," F. J. Allen, C., B. & Q.; J. C. Rockhold, A., T. & S. F. Ry., will present a paper on subject to be selected by himself.

Illinois Society of Engineers and Surveyors.

The 18th annual meeting was held at Aurora, Ill., Jan. 21, 22, 23. The programme in part was:

Wednesday, January 21, 1:30 P. M.

Report of Committee on Surveying....W. M. Hay, Chairman
Paper—The Real Estate Records of a Great Railroad System.....H. I. Orwig
Paper—The Proposed Co-operative Survey of Illinois. W. H. Herron
Report of Committee on Drainage....P. C. Knight, Chairman
Paper—Farm Drainage.....L. Z. Jones
Discussion—Methods to determine dimensions for channel excavations in long flat sloughs with lengthy tributaries running from hill slopes to insure reasonable drainage.
Paper—Open Ditch Drains.....P. C. Knight

Thursday, January 22, 8:30 A. M.

Report of Committee on Railroads. E. E. R. Tratman, Chairman
Paper—Work Train Methods and Records Rio Grande, Sierre Madre & Pacific Railway.....L. P. Atwood
Paper—The Duties and Work of the Consulting Engineer to the Illinois Railroad Commissioners. Frank P. Ewald
Paper—The Testing Laboratory of the Chicago, Burlington & Quincy Railroad at Aurora....Max Wickhorst
Paper—The Aurora, Elgin & Chicago Third Rail Electric Railway.....E. E. R. Tratman

Thursday, January 22, 7:30 P. M.

Discussion—Methods of renewing railroad bridges and trestles without interfering with traffic.
Discussion—The stability of earthwork placed on old railroad embankment.
Report of Committee on Roads and Pavements. I. O. Baker, Chairman
Paper—The Absorption Test of Paving Brick....A. N. Talbot
Discussion—Relative strength and cost of Natural and Portland cement concrete for street pavement.
Discussion—Present improvement laws of the State of Illinois.
Report of Committee on Water Works. J. W. Alvord, Chairman
Discussion—Centrifugal pumps, for what uses are they advantageous and what is their efficiency in speed?

Friday, January 23, 8:30 A. M.

Report of Committee on Sewers.....A. N. Talbot, Chairman
Discussion—Applicability of Septic Tank to sewage from combines systems of sewerage.
Report of Committee on Architecture. S. A. Bullard, Chairman
Paper—Growth of Schools of Engineering.....A. N. Talbot
Report of Committee on Electrical Engineering. D. W. Mead, Chairman
Discussion—The present status of the Electric Railroads.
Report of Committee on Structural Engineering. M. S. Ketchum, Chairman
Discussion—Cost of maintenance and life of girder and riveted bridges.
Report of Committee on Mechanical Engineering. J. A. Harmon, Chairman

A. L. KUEHN, Secretary, Champaign, Ill.

PERSONAL.

—Mr. W. Laing, Division Master Mechanic of the Texas & Pacific Railway for several years, is dead.

—Mr. Virgil G. Bogue, Consulting Engineer, No. 66 Broadway, New York, is in Mexico on special railroad investigation. He will be gone for several weeks.

—Mr. H. W. Bruce, Chief Attorney of the Louisville & Nashville, died at his home in Louisville, Ky., Jan. 22, aged 73 years. Mr. Bruce's railroad service dates from 1880, when he began as Assistant Chief Attorney of the above company, which position he held until 1895, when he was appointed to the position he held at the time of his death.

—Mr. Robert Packer Linderman died last week in Bethlehem, Pa., of blood poisoning from a very slight wound. Mr. Linderman had been President of the Bethlehem Steel Company and had been associated with other important industries in the region in which he lived. He was born July 26, 1863, and was a graduate of Lehigh University.

—Mr. H. J. Helps, whose appointment as Master Mechanic of the Burlington & Missouri River Railroad in Nebraska was announced recently, was born in London, England, in 1859. Mr. Helps came to America in 1885 and at once became machinist at Plattsmouth for the above company. The following year he was made draftsman, and in June, 1892, was appointed General Foreman.

—Mr. S. G. DeCoursey, President of the American Railways Company, died at his home in Philadelphia Jan. 27, aged 64 years. Mr. DeCoursey was President of the Western New York & Pennsylvania in 1892. A native of Queenstown, Md., he was educated at St. James' College in Washington County, Md., and first entered railroad service in 1888 as Vice-President of the Western New York & Pennsylvania, of which company he later became Receiver.

—Mr. R. F. McKenna, the new Superintendent of Car Shops of the Delaware, Lackawanna & Western, was born in 1868; was apprentice in the shops at Scranton from 1884 until 1890 in both the motive power and car departments; then for two years was chief draftsman and foreman. For five years he was air-brake inspector. In 1897 he became Superintendent of the Buffalo Car Wheel Works, where he remained until the latter part of 1898. In June the next year (1899) he returned to the Lackawanna as General Foreman at Dover, N. J., but was transferred in 1902 to a similar position on the Scranton Division and continued in this position until his new appointment as above.

—On Jan. 13, Mr. Allan W. Carpenter became Division Engineer of the Pennsylvania Division of the New York Central & Hudson River Railroad. Mr. Carpenter was born at Port Henry, N. Y., in 1873. He was graduated from Case School of Applied Science, Cleveland, Ohio, in 1895. Before graduating he held various minor positions in engineering corps on different roads. Afterwards he entered the service of Osborn Company, Civil Engineers of Cleveland. In March, 1900, Mr. Carpenter came east and entered the service of the Central as Assistant Engineer in the bridge department, where he remained until Jan. 14, 1902, when he was appointed Supervisor of Bridges and Buildings of the Pennsylvania Division, and from which position he has just been promoted to that of Division Engineer.

—Mr. Oscar W. Stager, Superintendent of Transportation of the Philadelphia & Reading Railway, is 54 years old. After receiving a public school education he entered the service of the Philadelphia & Reading Railroad as Telegraph Messenger and has been in the service of this company, now the Philadelphia & Reading Railway, ever since. From 1868 to 1869 he was Telegraph Operator at Reading, then train runner for a year and for the next 10 years was Manager of the telegraph office at Philadelphia. In 1880 he was made Superintendent of Telegraph, and discharged these duties until 1887, when he became Assistant Superintendent of the Main Line Division. In 1890 he assumed the duties of Transportation Master, from which position he has just been appointed as Superintendent of Transportation.

—Mr. E. B. Thompson, the new Master Mechanic of the Chicago & North Western at Mason City, Iowa, was promoted to that position from Mechanical Engineer of the road. While most of Mr. Thompson's career has been in the service of the North Western, his first position was with the G. F. Blake Manufacturing Company, Boston, Mass., as draftsman, after three years spent at the Massachusetts Institute of Technology. He became connected with the Chicago & North Western in 1882 as draftsman in the motive power department, and in 1889 was made Chief Draftsman. He was appointed Mechanical Engineer in 1895 and two years later went to the Northern Pacific as Mechanical Engineer. In 1899 he returned to the North Western as Mechanical Engineer, in which position he continued until his appointment on January 1 to be Master Mechanic of the Iowa and Minnesota Divisions.

—Mr. Elnathan Sweet dropped dead from heart disease in the Fort Orange Club, Albany, N. Y., Jan. 26. He was born in Cheshire, Mass., Nov. 20, 1837. He was graduated at Union College in the class of '59, in which year he went to Nebraska, where he was appointed deputy to General Ward B. Burnet, Surveyor-General of Kansas and Nebraska. In 1872 he returned to New York State, where he lived ever since. From 1869 to 1872 he was Chief Engineer of the Rock Island & St. Louis Railroad, and also the General Superintendent of the road in 1870 and 1871. He was engineering expert of the Canal Investigating Commission appointed by Governor Tilden in 1875. He was elected State Engineer and Surveyor of New York in 1883, and again in 1885. For many years he had been the head of the Hilton Bridge Construction Company. He was also receiver of the Lebanon Springs Railroad Company. He became a member of the American Society of Civil Engineers in 1878.

—Mr. C. F. Resseguie, who recently assumed the Superintendency of the Texas & New Orleans Railroad, was born in Green County, Wis., in 1847. From 1862 until 1885 he was connected with the Chicago & North Western, passing through the positions of messenger, telegraph operator and clerk. In the last named year he was appointed Superintendent of the Illinois Division of the Chicago, Burlington & Quincy, but resigned two years later to go with the Union Pacific in a similar capacity. In 1889 he was made General Manager of the Mountain Division at Salt Lake City. From 1892 until 1897 Mr. Resseguie was with the Atchison, Topeka & Santa Fe as Superintendent, and for the next three years was with the Gulf, Colorado & Santa Fe as General Superintendent, but returned to the Atchison in January, 1900, as General Superintendent. In October, 1901, Mr. Resseguie was made General Superintendent of what is known as the Eastern Grand Division, and retained that division until July, 1902.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—The First Division of this company has been sub-divided into the following districts: The Richmond, Norfolk, Fayetteville, Wilmington, Charleston and the Columbia. J. A. Fountain, of Richmond, Va., has been appointed Acting Superintendent of the Wilmington District, with headquarters in Wilmington, N. C.; W. H. Newell, Assistant Superintendent of Transportation at Norfolk, has been appointed Superintendent of the Norfolk District at Norfolk, and E. R. Wooten is the Superintendent of the Fayetteville District, at Rocky Mount.

Atchison, Topeka & Santa Fe (Coast Lines).—The headquarters of G. R. Joughins, Mechanical Superintendent, have been removed from San Bernardino, Cal., to Los Angeles.

Central New England.—D. A. Geraty has been appointed General Manager. This is a new position recently created. W. H. Seeley succeeds Mr. Geraty as General Freight Agent. Both with headquarters at Hartford, Conn.

Chicago & Eastern Illinois.—W. J. Jackson, heretofore Assistant General Superintendent, has been appointed General Superintendent, succeeding E. P. Broughton, assigned to other duties.

Chicago Great Western.—H. A. Fergusson, Assistant Superintendent of Motive Power, with headquarters at St. Paul, has resigned.

Chicago, Rock Island & Pacific.—M. K. Barnum, heretofore Master Mechanic of the Union Pacific, has been appointed Superintendent of Motive Power of the C., R. I. & P., with headquarters at Chicago, Ill., succeeding G. F. Wilson, resigned.

Chihuahua & Pacific.—C. L. Graves has been appointed General Manager, with headquarters at Chihuahua, succeeding Charles Sheldon, resigned.

Colorado & Southern.—See St. Louis & San Francisco.

Columbia Railway & Navigation.—N. W. Bethel, heretofore Chief Engineer of the Pacific & Idaho Northern, has been appointed Chief Engineer and General Manager of the C. Ry. & N., with headquarters at Dalles, Ore.

Delaware, Lackawanna & Western.—L. Bush, principal Assistant Engineer, succeeds Mr. McFarland as Chief Engineer, effective Feb. 1, 1903.

Erie.—C. V. Merrick, Division Superintendent, with headquarters at Bradford, Pa., has resigned. Mr. Merrick has been in the service of the Erie 31 years. E. T. Campbell, heretofore Acting Purchasing Agent, has been appointed Purchasing Agent.

As announced recently (page 37) G. M. Cumming, First Vice-President, has resigned, effective Feb. 1.

Great Northern.—A. C. Deverell, heretofore Superintendent of Shops, has been appointed Assistant Superintendent of Motive Power. H. Yoerg succeeds Mr. Deverell at St. Paul.

Hannibal & St. Joseph.—J. H. Sturgis, Assistant Treasurer, with headquarters at St. Joseph, Mo., has resigned.

Illinois Central.—W. H. Shaw has been appointed Foreman of Machinery, with headquarters at Carbondale, Ill.

Lake Erie, Alliance & Wheeling.—J. C. Irwin, heretofore assistant to the General Superintendent of the New York Central & Hudson River, has been appointed Superintendent of the L. E., A. & W., effective Feb. 1.

Lake Erie & Detroit River.—T. H. Prince has been elected President and M. H. Carpenter, Vice-President and General Manager.

Lake Shore & Michigan Southern.—F. Wilson has been appointed Assistant to the General Superintendent.

Lehigh Valley.—At a meeting of the Board of Directors held Jan. 26, J. A. Middleton, heretofore Assistant to Mr. Thomas, was elected Second Vice-President of this company and the Lehigh Valley Coal Co., with headquarters at Philadelphia, Pa. Mr. Middleton will have charge of the financial and accounting affairs of the company and of its purchasing department. The title of Rollin H. Wilbur has been changed from General Superintendent to General Manager. The duties of Mr. Wilbur will be the same as heretofore.

Little Falls & Dolgeville.—Charles Sullivan is General Manager of the recently reorganized L. F. & D. (See R. R. Construction column, Jan. 9, p. 38.)

Mexican International.—G. F. Jackson, heretofore Assistant General Freight and Passenger Agent, has been appointed General Freight and Passenger Agent.

Michigan Central.—D. L. Parker has been appointed Division Engineer, with headquarters at Niles, Mich.

Michigan State R. R. Commission.—Former State Senator T. W. Atwood has been appointed State Railroad Commissioner in place of Chase S. Osborn.

Morgan's Louisiana & Texas.—E. H. Harriman has been elected President.

Norfolk & Western.—J. B. Lacy has been appointed Assistant Treasurer, with headquarters at Roanoke, Va.

Northern Pacific.—M. P. Martin, heretofore Auditor, has been appointed Comptroller of all the subsidiary corporations controlled by the N. P. The position of Auditor has been abolished. W. C. Johnson has been appointed Auditor of Disbursements.

Pacific & Idaho Northern.—See Columbia Ry. & Navigation.

St. Joseph & Grand Island.—J. J. Barton has been appointed Assistant to the President, with headquarters at New York.

St. Louis & San Francisco.—S. L. Rainey, heretofore Superintendent of the Colorado & Southern, has been appointed Division Superintendent of the St. L. & S. F., with headquarters at Sapulpa, Ind. T., succeeding G. W. Schleyer, who has been transferred to Fort Smith, Ark.

St. Louis, Memphis & Southeastern.—M. Schulter has been appointed Industrial Commissioner, with headquarters at St. Louis, Mo.

St. Louis Merchants Bridge Terminal.—J. A. Johnson has been appointed Signal Engineer of this company and the Terminal R. R. Association of St. Louis, succeeding M. Wuerpel, Jr., resigned, effective Feb. 1.

Southern.—C. L. Ewing, Superintendent at Knoxville, Tenn., has resigned. (See Tennessee Northern.)

Tennessee Northern.—C. L. Ewing, heretofore Superintendent of the Southern, has been appointed Superintendent of the T. N., with headquarters at La Follette, Tenn.

Union Pacific.—See Chicago, Rock Island & Pacific.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

BALTIMORE & BEL AIR (ELECTRIC).—This company has been incorporated in Maryland to build between Baltimore and Bel Air, a distance of 20 miles. S. A. Williams, J. D. Worthington, Harold Walsh and J. A. Shreiber are interested.

BUTTE COUNTY.—This company has recently been organized in Jersey City to build and operate a line in Butte County, Cal. Russell Hawkins, J. R. Nolan, Stephen Van Wyck and E. D. Newcome, of East Orange, are among the incorporators.

CANADA NATIONAL.—Application will be made at the next session of Parliament for an act to revive the charter of this road, with rights to build from Toronto to Collingwood, Ont. McDowell Thompson, of Toronto, is interested.

CANADIAN NORTHERN.—Press reports state that the following branches are projected by this company: From Hartney, Man., to Regina, N. W. T.; from Swan River to a point on the Saskatchewan River; from Battleford to a point on the Brazeau River, Alberta; from Edmonton to Rocky Mountain House.

CANADIAN PACIFIC.—An officer writes that the Pheasant Hills extension from Kirkella to Neudorf, 106 miles, has been entirely graded and track has been laid be-

tween Kirkella and Scissors Creek, 40 miles. (Dec. 12, 1902, p. 953.)

Chattahoochee Terminal.—Articles of incorporation have been filed by this company to build a line about 20 miles long from the city of Atlanta, Ga., in a northwesterly direction through Fulton and Cobb Counties to the city of Marietta. T. A. Gramling, T. W. Glover and others, of Cobb County, and A. C. King, J. J. Spaulding and B. M. Fowler, of Fulton County, are among the incorporators.

Chicago, Rock Island & Choctaw.—Articles of incorporation have been filed by this company. The proposed route is from Amarillo, Texas, to a point in Guadalupe County. The headquarters of the new company will be at Chicago and Alamagordo, N. Mex.

Cleveland & Southwestern Traction.—See Railroad News.

Denver, Northwestern & Pacific.—Press reports state that the contract for the steel rails for the first 80 miles of this road out of Denver, has been let to the Colorado Fuel & Iron Company. The contract calls for 10,000 tons of rails, at an approximate cost of $300,000.

Duluth, Virginia & Rainy Lake.—An officer writes that this proposed road from Virginia to Koochiching, Minn., 100 miles, has been graded as far as Flint Creek, 30 miles, and that track has been laid for a distance of about 20 miles. The Minnesota Land & Construction Co., Duluth, Minn., are the contractors.

Florence Electric.—It is reported that this company has recorded a trust deed for $2,700,000 with the Eastern Trust Co., of New York, as trustee. It proposes to build and operate electric roads in and around Florence, Colo.

Gainesville & Dahlonega Electric.—An officer writes that the extensions from Gainesville, Ga., to New Holland, three miles, and from Gainesville to Chattahoochee, four miles, have been graded. Fifteen miles of track have been laid between Gainesville and New Bridge. A. J. Warner, of Dahlonega, Ga., is interested.

Galesburg & Kewanee.—An officer writes that this road, which is building between Kewanee and Galesburg, Ill., 41 miles, has been graded as far as Galva, eight miles. This last section is under contract to P. Hart & Sons, New Brighton, N. Y. Surveys have been made between Kewanee and Elmira, eight miles. (May 30, p. 430.)

Hammondsville & Bergholz.—This company has been incorporated to build a steam road between the two points named in Ohio, a distance of about 10 miles. H. A. Hall, Geo. A. Wilson, C. J. Davis, H. R. Linton and others are incorporators.

Harbor Springs.—An officer writes that a branch is to be built to Indian Garden, 5½ miles. The work will be done by the company's forces and will be commenced early in the spring. Ephraim Shea, Harbor Springs, Mich., is President.

Humboldt County.—This company has been incorporated in California to build from Alton to Camp Grant, a distance of about 50 miles. H. C. Smith, James Berry, Geo. C. Douglas and others, of Eureka, Cal., are said to be interested.

Illinois Black Diamond.—This company was incorporated on Jan. 19, to build from Harrisburg, Ill., through the Counties of Franklin, Perry, Washington, Clinton, Montgomery and Sangamon to Springfield, and eventually from Springfield to Peoria. H. A. Dirksen, Springfield; C. A. Ramsey, Hillsboro, and C. J. Lindley, Greenville, Ill., are interested.

Indianapolis, Columbus & Southern Traction.—At a recent meeting of the stockholders of this company it was decided to change the name from Indianapolis, Greenwood & Franklin to the above title. An increase in capital from $150,000 to $285,000 was authorized. This increase is to cover the expenses of extending the road to Franklin, and of eventually building the line through to Columbus. Joseph I. Irwin, Columbus, Ohio, is President.

Interurban Railway & Terminal.—An officer writes that the proposed route of this road is from Mason, via Kings Mills, Ohio, and South Lebanon, to Lebanon, 9½ miles. Grading has been completed from Mason to Kings Mills, a distance of three miles.

Kona-Kau.—It is reported that work has begun on the new line of this company from Napoopoo to a point near the Volcano House, where a connection will be made with the Hilo R. R. (Aug. 15, 1902, p. 750.)

Lake Erie, Bowling Green & Napoleon (Electric).—At a recent meeting of the directors of this company, it was voted to increase the capital stock to $1,000,000, and to extend the line from Pemberville to Port Clinton, 30 miles, and from Woodville to Oak Harbor. An extension from Bowling Green to Defiance, Ohio, is projected. Dr. W. M. Tuller, of Bowling Green, was elected President; E. H. McKnight, General Manager.

Lehigh & New England.—An officer writes that the Northampton extension of this road from Bath, via Nazareth and Stockertown, to Martin's Creek, 16 miles, has been completed as far as Stockertown, eight miles. The remainder of the road is under contract to the Keystone Constructing & Engineering Co., Easton, Pa.

Little Kanawha.—An officer writes that an extension is building from Sandy Bend through Elizabeth, Grantsville, Glenville and Brooklyn to Burnsville, 72 miles. McArthur Bros., Chicago, and Rinehart, Dennis & Co., Parkersburg, W. Va., are the contractors. Surveys have been made between Parkersburg, W. Va., and Zanesville, Ohio, 68 miles, and between Belington and Burnsville, W. Va., 60 miles. Grading will be begun within a fortnight. J. T. Blair, Parkersburg, W. Va., is President. (Dec. 5, 1902, p. 933.)

Louisiana Roads.—It is reported that the Hammond Lumber Co. of Hammond, La., will build a logging road six miles in length. Surveys have been made and rights of way practically secured. C. N. Burton, Hammond, La., is President.

Michigan Roads.—Crawford & Sons, Cedar Rapids, Mich., are reported to be building a logging road 30 miles long from Cedar River to Spaulding, Mich.

Midland Pacific.—Articles of incorporation have been filed by this company in California. The proposed route is from San Luis Bay through San Luis Obispo, Santa Barbara and Kern to Bakersville. A report of a road of the same name is made in our issue of Aug. 15, page 650. The incorporators of this road are A. L. Weil, M. A. Lippitt, E. D. Davis, J. W. Pauson and others.

Mobile, Jackson & Kansas City.—It is stated that the survey of this company between Newton and New Albany, 160 miles, has been completed. An extension from Hattiesburg to Jackson, Tenn., is projected.

Montana Roads.—A logging road is being built from Bonner, Mont., up the Blackfoot Valley for a distance of 30 miles. Names of interested parties not given. The reason for such a long logging road is due to the fact that the timber lands adjacent to the driving streams in this part of the country have been practically laid bare.

Morgan County.—Charter has been granted this company to build from Magnolia, W. Va., to Deep Gully, in Morgan County. H. McNeil, Jr., C. R. Webber, E. J. Silkman, of Baltimore, and John J. Bumbardner, of Westminster, Md., are incorporators.

Mountain Park Electric.—Charter has been granted this road to build from Wildman to Mountain Park, 15 miles. R. D. Simpson, G. J. Galena and J. C. Brown, of Guthrie, Okla. T., are interested.

Nashville, Chattanooga & St. Louis.—Contract for the extension of this line from Tracy City to Nunally Ridge, 6½ miles, has been let to C. J. McKinney & Co., Nashville, Tenn. Work has already begun.

Nashville Street.—It is reported that this road is to be changed from narrow to standard gage. It controls about 65 miles of trackage and the cost of changing the road will be about $60,000. This company is controlled by the Newman Syndicate of New Orleans.

Olympia, Shelton & Bremerton.—This company has filed articles of incorporation in Washington. The proposed route is from Olympia through Shelton to Bremerton, a distance of about 50 miles. Connection will be made with the Northern Pacific at Olympia. A. J. McCabe, C. A. Murray and E. C. McDonald, of Tacoma, Wash., are incorporators.

Oregon Water Power & Railway.—An officer writes that this line, which is building between Portland and Springwater, Ore., 40 miles, has been graded between Deep Creek and Currinsville, 15 miles. Track has been laid between Lents and Gresham, 6½ miles. (Nov. 28, 1903, p. 918.)

Ozark & Cherokee Central.—An officer writes that an extension from Muskogee, Ind. T., to Shawnee, Okla. T., 100 miles, is now under contract to the Kenefick Construction Co., Muskogee, Ind. T. This is a part of the proposed road from Fayetteville, Ark., to Shawnee, Okla. T., a distance of 200 miles.

Quebec Roads.—It is reported that application will be made at the next session of Parliament to build from Joliet, in a northerly direction to Ste. Michael Emilie de L'Energie, and thence in a northwesterly direction to Lake Manuan. D. J. McDongal, Ottawa, Ont., is interested.

Raleigh & Cape Fear.—Work is reported on the extension of this road from Sippahaw to Lillington, N. C., 14 miles. Stewart & Jones, of Clifton, Va., are the contractors. Work is also reported on an extension from Angier in a southeasterly direction. J. A. Mills, Raleigh, N. C., is President.

Rock Island & Southeastern.—This company has filed articles of incorporation to build from Rock Island to Peoria, 97 miles. Wm. P. Kopf, Assistant Secretary of the American Trust & Savings Bank; C. A. Newton, Horace W. Nichols, Jr., and E. S. Hall, all of Chicago, are interested.

St. Joseph & Eastern.—This company has been organized to build from Benton Harbor and St. Joseph to Cassopolis and Diamond Lake, Mich., a distance of about 40 miles. Orville G. Wales, 84 La Salle street, Chicago, is interested.

St. Louis, Kansas City & Colorado.—The following sections from Belle to Versailles, Mo., 72 miles, and from Versailles to Kansas City, 120 miles, are under contract to H. F. Balch & Co., 115 South Fourth street, St. Louis, and to Stubbs, Flick & Johnson Construction Co., New York Life Building, Kansas City. Grading has been completed between Belle and Versailles, and track laid to Koeltztown, 24 miles. (Official.)

Salem, Falls City & Western.—An officer writes that this road is now being built from Dallas to Falls City, nine miles. Grading is completed out of Dallas for a distance of seven miles, and is being done by the company's forces. L. Gerlinger, Portland, Ore., is President. (Dec. 12, 1902, p. 954.)

Salt Lake & Suburban.—Franchise has been granted this company to build from Salt Lake City to Murray, Bingham Junction, Sandy, Union, Holliday, Taylorsville and Mill Creek Canyon. Forty-two miles have already been surveyed and grading will probably begin early in the spring. A. V. Taylor, Salt Lake City, Second Vice-President. (Aug. 1, 1902, p. 616.)

South Bend & South Michigan.—An officer writes that the line from South Bend, Ind., via Niles and Berrien Springs to St. Joseph, Mich., 35 miles, is graded as far as Niles. C. H. Defrees, South Bend, Ind., is the contractor. A. J. Hammond, South Bend, may be addressed.

Southern.—Press reports state that the Southern will make the following improvements during the coming year. Relaying of the Memphis division with 80 lb. rails. New terminal at Meridian, Miss. Additional yards at Birmingham, Ala., including about 12 miles of track. New passenger depot at Atlanta, Ga., which will not be completed before the spring of 1904. Substitution of modern steel bridges for all the old bridges on the Knoxville division, between Asheville, N. C., and Jellico, 300 miles.

Susquehanna & New York.—An officer writes that the proposed route of this road from Towanda to Ralston has been completed to Laquin. Grading is under way between Laquin and Wheelerville, 10 miles. Crary Construction Co., Binghamton, N. Y., and Whalen Bros., Towanda, Pa., are the contractors. Surveys have been made between Ralston and Grays Run, 19 miles. (Sept. 12, 1902, p. 716.)

Timpson Northwestern.—An officer writes that the proposed route of this road from Timpson, Texas, via Ragley to Henderson, 36 miles, is completed as far as Ragley, 10 miles. Contract for the remaining portion of the road will be let about April 1.

Vicksburg & Gulf.—The Governor of Mississippi has recently authorized the incorporation of this road. It is proposed to build from Vicksburg through the Counties of Warren, Hinds, Lincoln, Copiah, Lawrence, Marion, Blue River and Harrison to Gulfport, a total distance of about 180 miles. B. W. Griffith, C. J. Searles, W. N. Moore and others, of Vicksburg, Miss., are interested.

West Virginia Central & Pittsburgh.—Work on the extension of this line from Elkins to Durbin, W. Va., 46½ miles, has been practically completed. Rails have been laid from Elkins south to Cheat River, 21 miles, and from Durbin north for a distance of five miles. The road will be opened for traffic early in the spring. C. M. Hendley, Secretary, Elkins, W. Va. (Official.) (Dec. 19, 1902, p. 972.)

Wisconsin & Michigan.—An officer writes that the extension from Faithorn Junction, Mich., via Sturgeon Mills, Lauretto and Norway to Quinnesec, 17 miles, has been graded between Lauretto and Norway, five miles. Track has been laid from Faithorn Junction to Sturgeon Mills, eight miles. Thomas Phee, Chicago, Ill., is the contractor. B. C. Gowen, Peshtigo, Wis., is Chief Engineer.

Yankton, Norfolk & Southern.—An officer writes that the proposed route of this road is from Yankton, S. Dak., through Norfolk, Sutton, Davenport and Chester, all in Nebraska, to Minneapolis, Kan., a distance of 310 miles. The section from Yankton to Pierce, 45 miles, has been graded by the company's forces. Extensions are projected from Minneapolis to the Gulf of Mexico, and from Yankton to Winnipeg, Man., but no surveys have as yet been made. (Dec. 19, 1902, p. 972.)

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—Returns for the six months ending Dec. 31, 1902, show gross earnings of $31,695,052, as against $30,876,256 during the same six months in 1901, an increase of $818,796. Operating expenses were $18,768,832, an increase of $1,365,216 over 1901. The net earnings in 1902 were $12,926,220, and in 1901, were $13,472,641, showing a decrease of $546,420 during the last six months of 1902.

Baltimore, Sparrows Point & Chesapeake (United Railways).—At a recent meeting of the directors of this road, it was voted to issue $2,000,000 of bonds, the Maryland Trust Co. to be trustee. This action was later ratified by the stockholders. The proceeds are to be used to retire $300,000 of old bonds, and to build several minor extensions.

Brockville, Westport & Sault Ste. Marie.—This company has been sold to a New York syndicate for $160,000. John Gerken, C. P. Koenig, Chas. F. Holm and Henry Gennerich, President of the United National Bank, are members of the syndicate. (Jan. 9, p. 38.)

Cleveland & Southwestern Traction.—This company has been formed by the consolidation of the Cleveland, Elyria & Western and the Cleveland & Southern, with a capital of $5,000,000. A. H. Pomeroy, of Cleveland, is President of the new company, which will control lines between Cleveland, Berea, Norwalk, North Amherst, Lorain, Grafton and Wooster, Ohio.

Fonda, Johnstown & Gloversville.—The State Board of Railroad Commissioners has approved the proposed issue by this road of $7,000,000 first mortgage bonds, and also an increase in capital from $1,950,000 to $2,500,000. The proceeds from the greater portion of the new issue will be used for refunding the outstanding bonds of this company, as well as the bonds of the Cayadutta Electric, which was recently purchased by this company. The proceeds from the sale of the remainder of the bonds will be used for new construction.

Indianapolis, Columbus & Southern Traction.—Formerly the Indianapolis, Greenwood & Franklin. See Railroad Construction under above title.

Lake Erie, Alliance & Wheeling.—Press reports state that this road, which runs from Phalanx to Amsterdam, Ohio, 65 miles, has been sold to the Lake Shore & Michigan Southern. Calvary Morris, Cleveland, Ohio, is President.

Lake Shore & Michigan Southern.—See Lake Erie, Alliance & Wheeling above.

New York Central & Hudson River.—This company has recently purchased practically the entire Spuyten Duyvil water front. The land acquired contains a large number of acres on the north and south sides of the United States Ship Canal, and on the Hudson and Harlem Rivers.

Northern Securities.—An increase in the dividend of this company to 1⅛ per cent. quarterly has been made, placing it on a basis of 4½ per cent. dividend.

Oregon Short Line.—Application has been made by the Union Pacific, which controls this company, for the listing of $10,000,000 Oregon Short Line bonds on the New York Stock Exchange. These are a part of the issue authorized July, 1902, when $31,000,000 of bonds were listed. The Short Line bonds pay 4 per cent. interest, and are entitled to any extra dividend declared by the Northern Securities Co. As this company has recently increased its dividend ⅛ per cent. quarterly, the bonds are now paying 4½ per cent. interest annually.

Pere Marquette.—The Lake Erie & Detroit, which was recently purchased by this road, has been opened for freight traffic. Passenger trains will be run over the route at a later date. At a meeting of the stockholders of the Pere Marquette on Jan. 20, the purchase of the Lake Erie & Detroit was approved.

Roanoke Railroad & Electric.—This road has been sold to a number of Philadelphia capitalists. The line owns 20 miles of track. R. Apperson, Lynchburg, Va., has been elected President. J. W. Hancock, Roanoke, Va., General Manager.

St. Louis, Iron Mountain & Southern.—At a special meeting of the stockholders of this company on Jan. 23, the purchase of the property, rights, and franchises of the White River R. R. was ratified. It was voted to increase the capital stock by the amount of $10,000,000.

Union Traction (Indiana).—Press reports state that this company has bought the Wabash River Traction, which runs from Wabash via Peru to Logansport, Ind., 34 miles. The system also includes several city lines through and around Logansport.

Wabash River Traction.—See Union Traction above.

Willmar & Sioux Falls.—This company recently purchased the Sioux Falls & Northern, which runs from Sioux Falls to Garrettson, S. Dak., 20 miles. W. S. and Robert E. Todd, of New York City, transacted the sale.